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The AUTOMOBILE

Starters and Generators in Factory De Luxe

New Gray & Davis Boston Factory for Starters and Generators Has 3 Acres of Floor Area, Employs 600 Men and Manufactures Over 300 Systems Per Day

By Sydney Oxberry

IN these days of the big manufacturer a phrase which is becoming well worn is "large production." There seems to be a tendency to attribute all the industrial successes to mere size of production. This is only partly true. It should not be forgotten that it is only when a large plant couples with the size of its producing facilities the factor of efficiency in the manufacturing operations that a cheap and good article is possible. By efficiency of operation is here meant, not only the employment of the latest machinery, but the location of these machines and departments of the factory with such regard to sequence that the minimum of time is wasted in the transfer of the article from one machine to the next throughout its manufacture.

Initial Layout Important

It is only in recent years that the full importance of the initial lay-out of a manufacturing plant has received the attention it deserves. The value of the new methods can be forcibly brought out by an inspection of older factories whose business has grown. Constant additions to the plant have been necessary and owing to the difficulty of making alteration in all the departments at the same time, which is the only proper course, a general disproportion both as to size and location is set up between the machines and sections that incurs tremendous losses by interfering with the steady flow of manufacture. The only course is an entirely new lay-out.

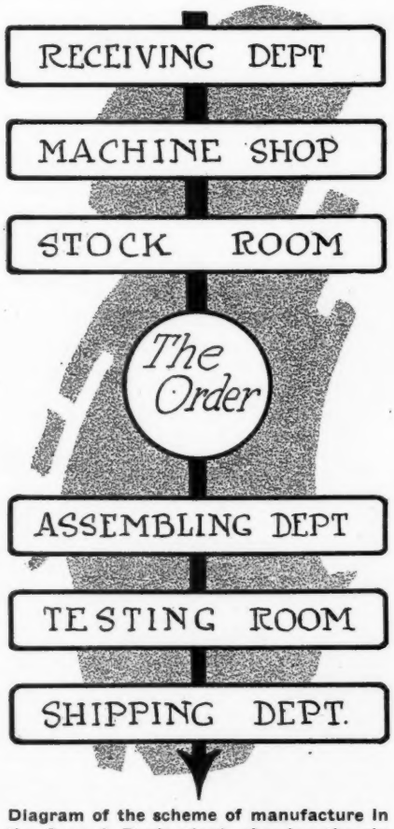
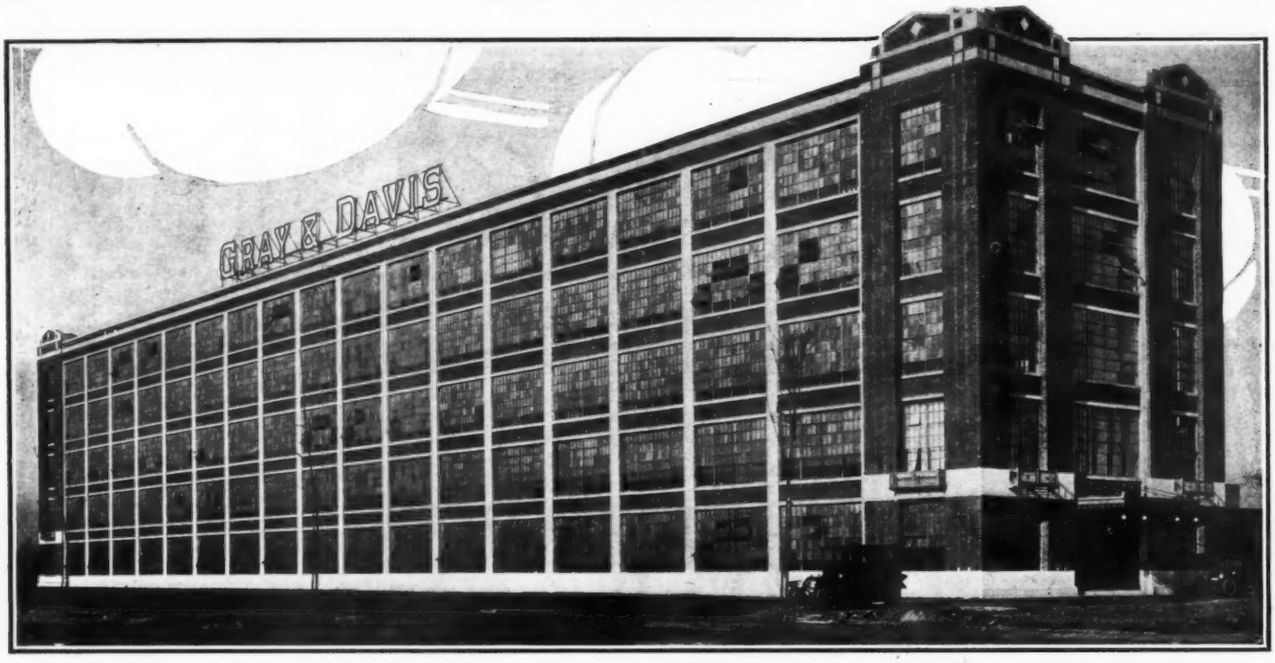


Diagram of the scheme of manufacture in the Gray & Davis plant, showing the six main departments in sequence

The automobile industry is new enough, big enough and there is an ample degree of competition in it to offer a splendid field for the study of the efficient factory. Some idea of the wonders of the industry may be obtained by the sudden growth and great activity displayed in the making of electric equipments for the automobile which can be considered a mere branch of the parent industry. Yet there are scores of large factories busily turning out generators and starting motors to meet an insistent demand. So great was this demand only 2 years ago and even to a lesser extent last year that the car builder was scarcely in a position to dictate on the matter but had to buy his electrical equipments where possible to give his cars a chance on the market. These conditions are naturally changing for the better. A small number of the best systems will win out and the manufacturers who are producing a uniformly reliable lighting and starting set and do so in large quantities are proving this point by a rate of development and growth that was unheard of before the days of the automobile industry.

To illustrate by a specific instance, there has recently been completed a factory



View of the new Gray & Davis plant at Boston, Mass., which is being used exclusively for the manufacture of lighting generators and starting motors

with a total floor area of 140,000 square feet, approximately 3 acres, embodying all the latest manufacturing facilities, and including modern office equipment and systems to be devoted solely to the production of lighting generators and starting motors with the necessary cut-outs and wiring but exclusive of the lamps and batteries. This is the new plant of the Gray & Davis Co., Boston, which employs about 600 men constantly with an output which averages 320 complete systems a day. It is a significant landmark in the progress of electricity applied to the gasoline car.

Scheme of Manufacture

The main building is a well-lighted five-story structure, 381 feet 6 inches in length with a width of 81 feet in the first story and 61 feet in the remaining stories. There is a central rear extension or ell as shown in the plan below, containing the elevator, stairway and various small rooms and departments.

The underlying scheme of the factory consists of six main operations as follows: 1, Receiving; 2, machining; 3, stocking; 4, assembling; 5, testing and 6, shipping.

Receiving

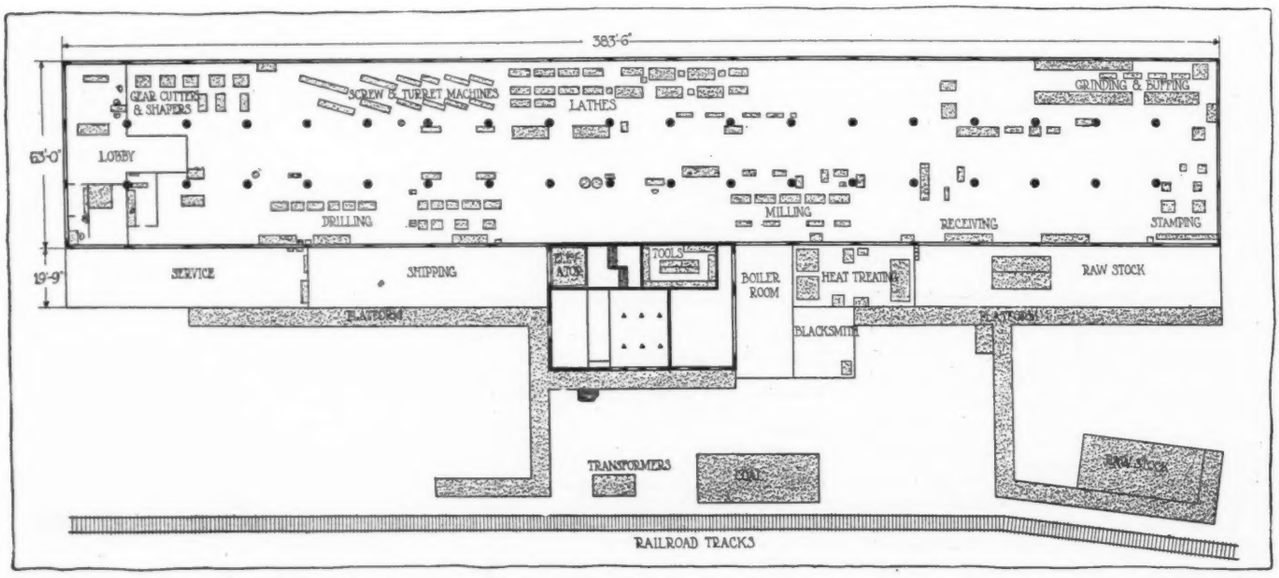
Everything which enters the factory, raw materials, castings, tools, office supplies, etc., pass through a door at one end and a record is made before entering the factory proper.

Machining

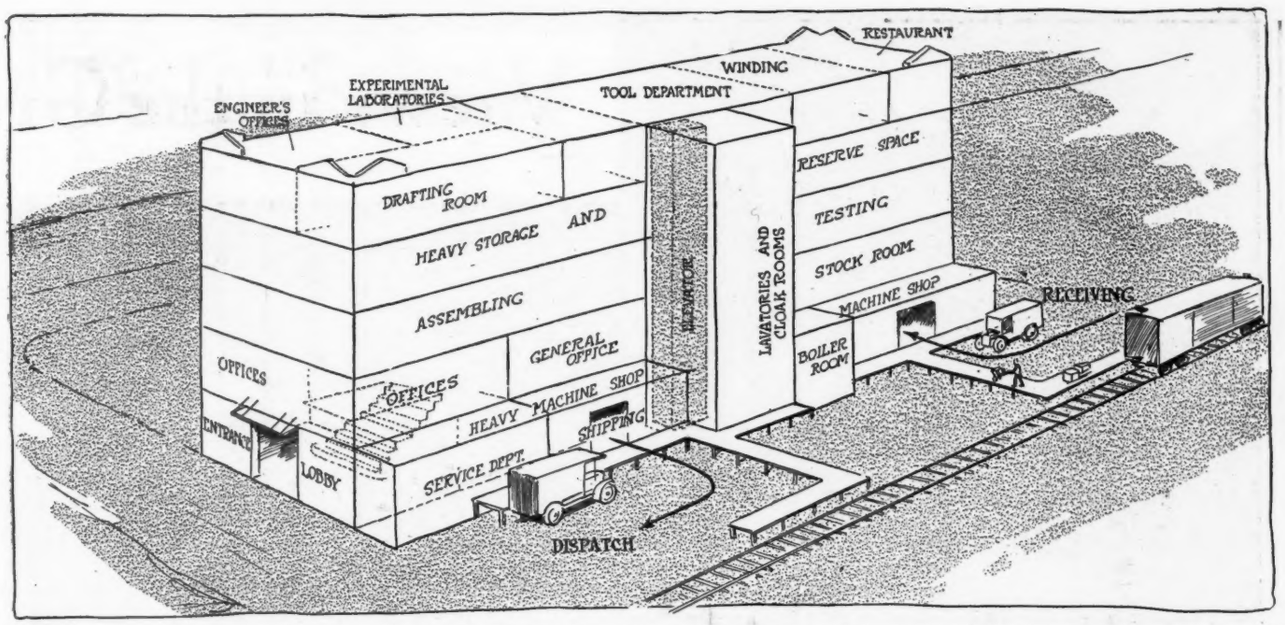
All machining, punching, milling, grinding, drilling takes place on the ground floor, the whole of which is used for this purpose.

Stocking

The machined parts are then passed up to the next floor where they are stocked in steel trays arranged in numbered racks and entered in a card index from which can be ascertained at any



Plan of the ground floor, showing the shipping and receiving platforms and the layout of the machines in the main machine shop, which occupies practically the entire ground floor



Perspective outline showing the location of the various departments in the Gray & Davis factory, from the receiving department at one end to the shipping at the other

moment the exact quantity of any part in stock. A definite minimum of parts is always kept on hand.

Assembling

When filling an order the required parts are withdrawn from the stock room and sent up to the assembling department where assembling, winding and the fitting of connections and cut-outs take place.

Testing

The finished motors and generators with fittings are then passed to the testing department where individual, general duration tests and abuse tests are made, the results being entered on a standard reference card which is numbered and kept as a permanent record of each machine.

Shipping

Having met the requirements of the tester the machines are returned to the ground floor and at the opposite end to the receiving department are shipped directly to the railroad siding.

The above processes are carried out with the parts during manufacture passing continuously from one department to the next without loss of time in transport.

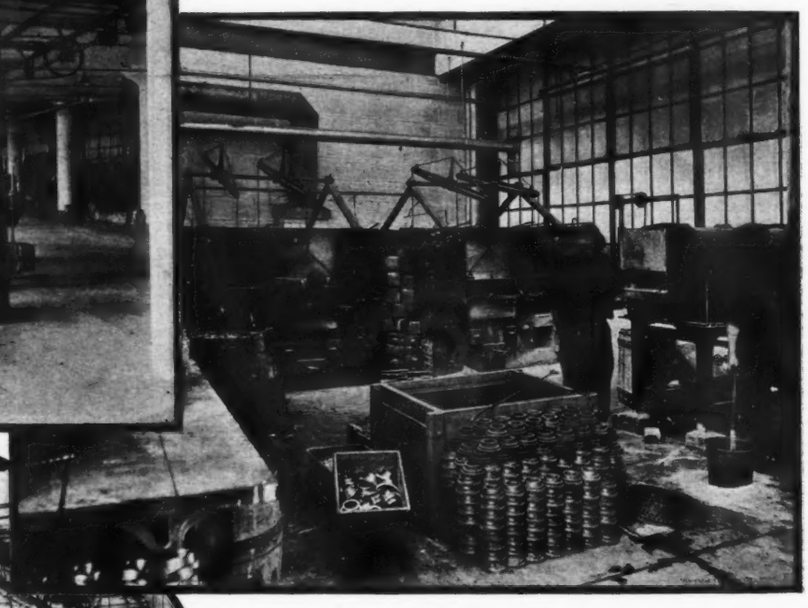
The machine shop on the ground floor occupies the full length of the building with the exception of the lobby at one end which leads to the offices on the second floor. The machines are arranged in banks, the gear cutters and shapers, automatic, turret and chuck lathes, and drills being at one end and the grinding, stamping and buffing machines at the other.

Overhead Motors Used

Power is furnished from overhead motors attached to the ceiling and driving through belt or chain to the shaft sections. The small unit principle of power supply for a machine shop makes it possible to operate a few of the machines at a time economically. Each motor supplies power for four or five machines. The one story portion at the rear is divided at one end into a receiving department and a heat-treating room and at the

View down the corridor of the general offices. These are situated on the second floor and occupy the full width of the building. Note large lighting area

Views in the Gray



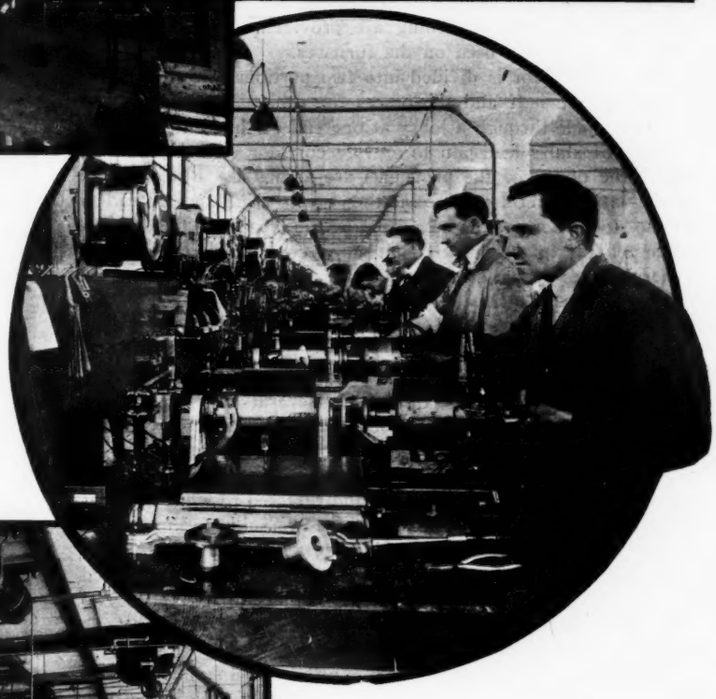
Above at the left is a general view in the heavy machine shop on the main floor, showing the ample spaces about the machines. Power is supplied from overhead motors connected to the shafting by belts and silent chains, each motor operating four or five machines.

Above at the right, the heat treating room which has a complete equipment of furnaces with electrical heat indicators, oil and water baths and means of hardening by carbonization from powdered bone. A room at the side contains an electric driven air compressor for supplying the furnaces.

In the circle, one of the banks of drills in the main machine shop. Most of the drilling is done in jigs to insure uniformity. It will be noticed that stools are provided for the employees wherever the work is such that it can be performed as easily seated.

To the right, a view in the winding department on the fifth floor where women are employed winding the coils of the armature, fields and cut-outs of the electrical equipments. Generators and motors which fail to meet the full requirements of the subsequent tests are returned here for rewinding.

& Davis Factory



Above, at the right, is shown the testing department where all motors and generators pass before dispatch. The test being conducted in the foreground is the duration test of generators which are run for several hours from the shaft above the center of the bench.

Above at the left, view in the assembling room where the field magnets, coils, armatures, and brush gears are assembled ready for passing to the testing department. This photograph also illustrates the numbering of the bays and floors throughout the factory by symbols on the columns.

In the circle, testing starting motors on torque balances at various currents. A record is kept of the torque in foot pounds of every motor and its consumption of current for future reference. All machines, both generators and motors, are numbered, and a card system of records kept showing time of manufacture and full results of the factory tests.

At the left, the tool department in which all tools and jigs are made. A tool supply room stands next to the elevator at every floor so that there is no loss of time in the transference of tools from the tool-making department.

View in the drafting office of the new Gray & Davis plant

other into shipping and service departments. In the heat-treating department, furnaces and equipment for oil, water, carbon and powdered bone hardening are provided. Electric temperature indicators are used on the furnaces.

The second floor is divided into two portions, the stock room occupying one half and the offices the other. Entrance to the offices is made through a lobby at one end of the building where a flight of stairs leads on to a wide corridor on both sides of which the offices of the principals are arranged. Beyond these is the large general and accounting office. The superintendent of the stock room at the other side of the office partition has his office actually in the stock room but in communication with the general offices so that direct reference can easily be made between the two departments.

All Generators Fully Tested

On the third floor above the stock room is the testing department. All generators are run in for several hours on a long bench with a driving shaft turning the armatures at a constant speed. The output and other results of the test are entered on record cards attached to each machine until they are finally dispatched when these cards are filed and referred to when any machine comes in for repair. The motors are subjected to several tests, the most severe being the abuse test in which the circuit is made and broken at a rapid rate by a mechanically operated switch, a friction brake acting on the armature all the time. Assembling is done on the same floor, this operation being the one immediately preceding the testing.

The fourth floor is not as yet fully utilized and stands more as a reserve space for the future, although it is temporarily used as convenient storage for heavy stock.

The fifth and top floor is divided into four main sections, tool making and winding shop, experimental laboratories with engineers' offices, drawing office, and restaurant. The tool department is adjacent to the elevator and as the tool supply on each floor is in the rear tower containing the elevator, tools can be transferred quickly from or to any floor. Jigs are used whereever possible and this represents an important function of the tool department where these jigs are made.

Restaurant Is Provided

The restaurant has been thought necessary owing to the rather isolated situation of the plant, and finds favor with the employees. There is seating accommodation for eighty in the restaurant itself but its uses extend much further. Orders can be received from any floor by telephone and at the lunch hour the food is sent down by the elevator.

A full staff of electrical experts is always at work in the well equipped experimental laboratories, of which there are two. One of these is devoted to mechanical testing such as determining the most suitable methods of applying the starting motor to various types of engine, while the other contains delicate electrical instruments for experimental work on new generator design, etc. The tables in this laboratory are supported on heavy concrete legs to eliminate vibration. Adjacent to these rooms are the offices of the engineers.

The drafting room is also on this floor and is complete with a blue print room.

Plant Location Symbols

Throughout the plant all columns are numbered to indicate the position of the machines. Thus: 5-13 indicates the fifth floor and the thirteenth bay. A similar method of numbering the stock room bays is followed. Each rack is numbered and the shelves carry a letter; thus the symbol 12-A on the order card enables the parts so indexed to be readily found. Wood trays designed to accommodate the parts during manufacture are used to carry a certain number from the beginning of the machinery operations to the finish. These are all made in the factory in the carpenter's shop.

The system of heating has been worked out very ingeniously,

Wash rooms are provided on every floor

Stairway and entrance to the offices from the lobby

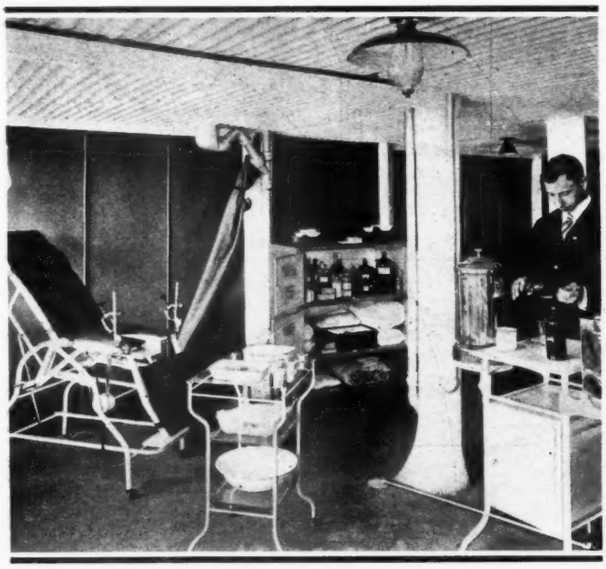
this being one of only three buildings in the United States in which the peculiar combination to be described has been installed. The unusual window area made it necessary to use a large amount of radiation surface for heating. To have provided this in the form of coils and radiators along the walls would have involved a great many large units. It was decided, therefore, to use the sprinkler piping in the ceiling as an auxiliary heating surface. This, of course, necessitated the use of hot water as a heating medium.

In the shipping department of the Gray & Davis plant

Special Sprinkler System

To guard the Grinnell sprinkler heads from the heat in the water and prevent the fusing of their solder links, with consequent leakage, the heads were placed on offsets about a foot long. The water in these offsets is, of course, not in circulation, whereas the system of piping is so arranged that continuous circulation is kept up from the riser on one side of the building to the return on the other in each of several sections. In this way the distribution of heat is kept uniform all over the building, while at the same time the pipes, being continually traversed by moving water, cannot become clogged in any place.

The water is kept in circulation by a centrifugal pump coupled to an electric motor in a room adjacent to the boilers on the ground floor. Two of these pumps are installed but only one need be used at a time. One is larger than the other, the large one being used in the coldest weather when a faster circulation is desired. The smaller pump is sufficient for ordinary winter temperatures. One of these is driven by a directly coupled steam engine supplied from the boiler in the next room so that the risk of being without heat through failure of one or other source of power is practically removed.



A hospital is maintained inside the factory for emergencies

The corridor of the main offices from the entrance

Two boilers are located in the boiler room, the larger one supplying the hot water for the heating system while the other furnishes steam for cleaning jets in the factory and also for the restaurant.

All cloak rooms, lavatories and toilets are located in the rear extension which has intermediate floors and so provides the necessary area. Separate lockers for the employees are not used as it has been thought less sanitary than the rack and separate coat hanger method. The toilets are all distinct from lavatories and cloak room so that the latter can remain locked during the work hours. Entrance can only be made by application to the foreman of the floor for the key. In this way there is practically the same assurance from theft as with separate lockers while the advantages of more air around the coats though using less ground space is possible.

Wash Rooms on All Floors

In other ways there is much evidence that the most sanitary conditions have been sought after. Large wash rooms with tile basins are on every floor. A hospital provided with an equipment for dealing with any accident is on the fourth floor and a qualified physician is always in attendance. In addition a bed is maintained in the Boston City hospital. But the risk of accident has been reduced to a minimum, full protection in the form of rails being afforded at all dangerous points. All pulleys about machines are guarded.

Steel sash is used throughout for the windows being adjusted so that 33 per cent. of the window area is adjustable for ventilation. Natural ventilation alone is provided.

Throughout the factory at all work which can be done as well sitting as standing the employees are allowed the use of chairs. A noticeable feature of the building which is in line with latest practice is the large window area. This covers 70 per cent. of the total wall area.

Reinforced concrete is used in the construction. The ornamental end bays are faced with brick while the substructure is concrete. Those portions of the wall between pilasters which are not occupied with the steel sash windows are of concrete panelled with tapestry brick. There is no basement.

A Map of Detroit, Showing Location of A

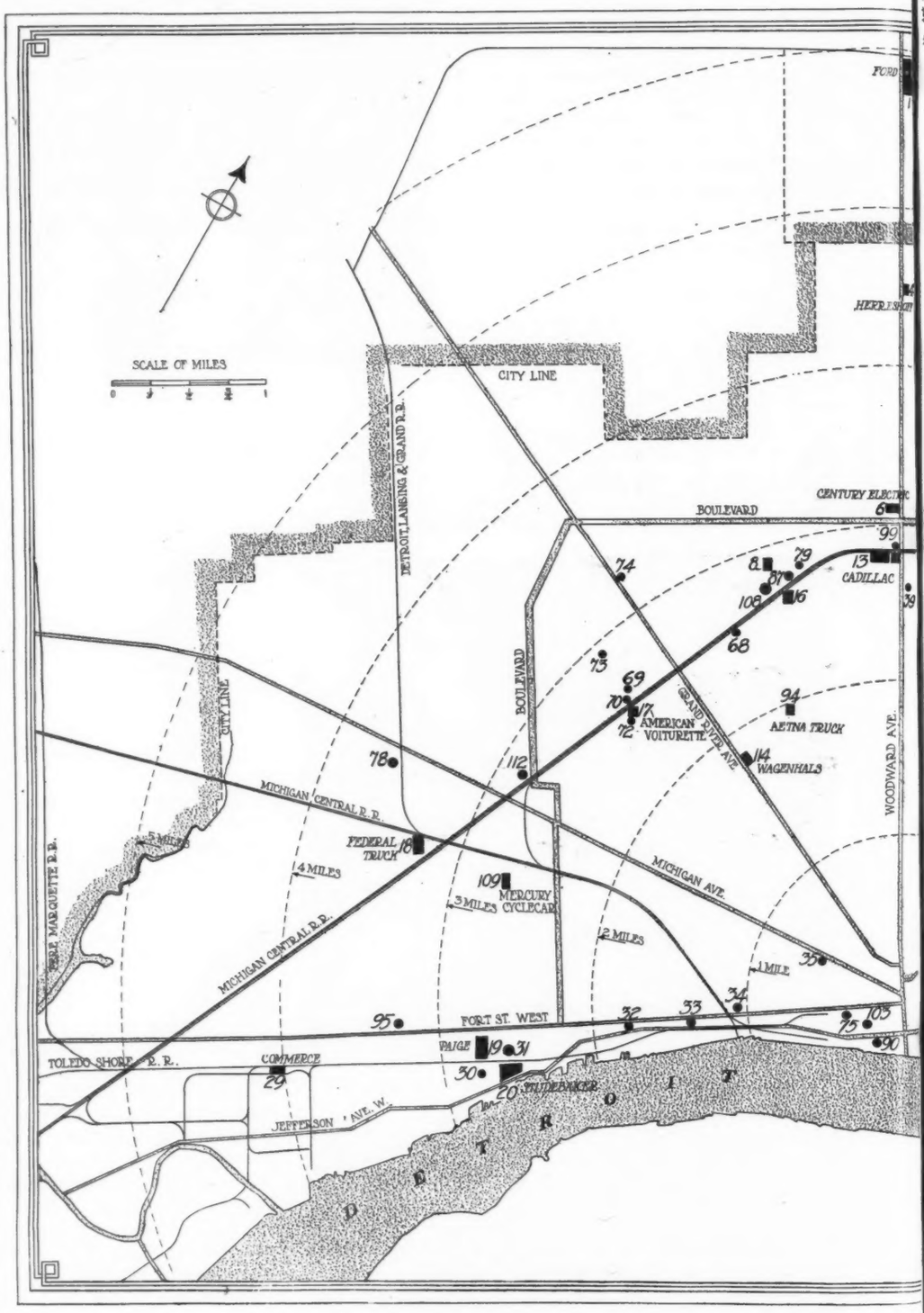
Concerns Located on Map

VEHICLE MAKERS

Abbott Motor Car Co..... 22
Ætna Motor Truck Co..... 94
American Volturette Co..... 17
Anderson Electric Car Co..... 7
Briggs-Detroiter Co..... 5
Cadillac Motor Car Co..... 13
Century Electric Car Co..... 6
Chalmers Motor Co..... 26
Commerce Motor Car Co..... 29
Day Automobile Co.....101
Federal Motor Truck Co..... 18
Ford Motor Co..... 1
Grinnell Electric Car Co.....105
Herreshoff Motor Co..... 4
Hudson Motor Car Co..... 28
Hupp Motor Car Co..... 10
King Motor Car Co..... 21
Krit Motor Car Co..... 11
Lozier Motor Co..... 25
Maxwell Motor Co..... 2
Maxwell Motor Co., Brush..... 3
Mercury Cyclecar Co.....109
Monarch Motor Car Co..... 92
Packard Motor Car Co..... 12
Paige-Detroit Motor Car Co..... 19
R-C-H Corp..... 27
Regal Motor Car Co..... 15
Saxon Motor Car Co..... 93
Scripps-Booth Cyclecar Co..... 16
Signal Motor Truck Co..... 8
Studebaker Corp..... 14
Studebaker Corp..... 20
Standard Motor Truck Co..... 23
Universal Motor Truck Co..... 24
Wagenhals Motor Car Co.....114

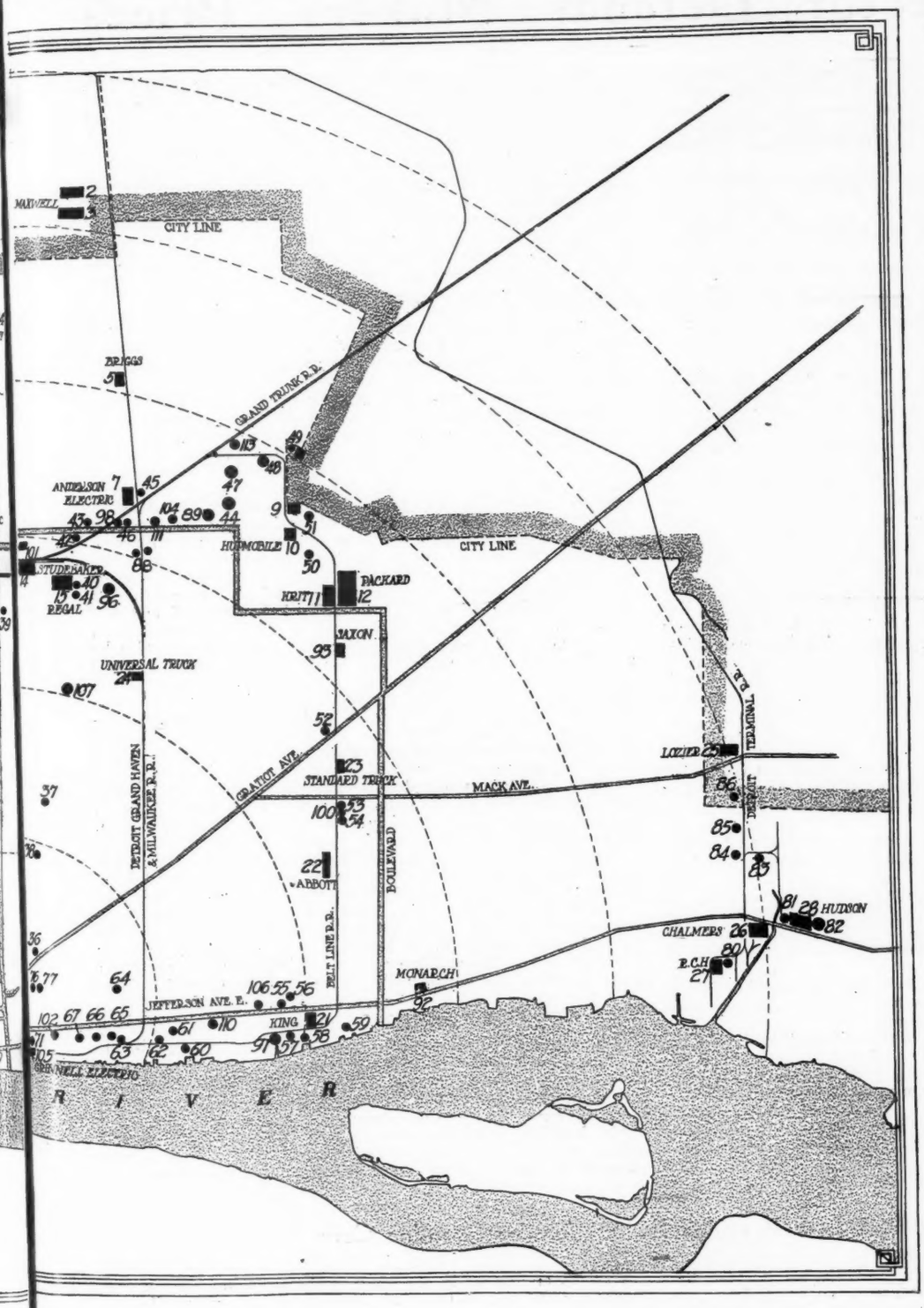
PARTS AND ACCESSORY MAKERS

American Air Compressor Co..... 95
American Blower Co..... 96
Armitage Leather Co..... 33
Auto Crankshaft Co..... 41
Aluminum Castings Co..... 44
Anderson Forge & Machine Co.... 81
Auto Parts Mfg. Co..... 88
Benham Mfg. Co..... 49
Berry Bros. 97
Bower Roller Bearing Co..... 85
Briggs Mfg. Co..... 98
Briscoe Mfg. Co..... 99
Christie-Kline Forge Co..... 62
Continental Motor Mfg. Co..... 82
Cross Gear & Eng. Co.....100
Detroit Copper & Brass Co..... 30
" Electric Appliance Co...102
" Socket Co. 32
" Pressed Steel Co..... 51
" Heating & Light Co..... 57
" Forging Co. 58
" Gear & Machine Co..... 63
" Screw Wks. 67
" Steel Prod. Co..... 89
" St'r'g Wh. & W'dsh'd Co. 65
" Lubricator Co. 87
Dodge Bros. 47
Disco Co. 55
Edmunds & Jones Mfg. Co..... 72
Fisher Body Co..... 40
Fisher Elect. Wks.....103
Gemmer Mfg. Co..... 73
Gen. Aluminum & Brass Cast. Co.104
Golden, Belknap & Swartz..... 74
Greenslade Oil Co..... 90
Gray-Hawley Mfg. Co.....106
C. M. Hall Lamp Co.....107
Hanson Tool Co..... 36
Holly Bros. Co..... 37
Huebner Mfg. Co..... 50
Herbert Mfg. Co..... 68
Hayes Mfg. Co..... 70
Jeffrey-DeWitt Co. 46
Kales-Haskel Co..... 34
Kelsey Wheel Co..... 78
Lavigne Mfg. Co.....108
Long Mfg. Co..... 43
Michigan Lubricator Co..... 38
McCord Mfg. Co..... 42
Michigan Stamping Co..... 53
Morgan & Wright..... 59
Michigan Auto Trimming Co..... 61
Michigan Top Co..... 64
Mobile Top Co..... 71
Metal Products Co..... 83
Michigan Electric Welding Co.... 84
Motor Foundry & Machine Co..... 86
Murphy-Potter Co. 110
National Can Co.....111
Northway Motor & Mfg. Co..... 69
Russell Wheel & Foundry Co..... 48
Ross & Young Machine Co..... 56
Peninsular Auto Parts Co..... 76
Rands Mfg. Co..... 79
Smith, J. N. Co..... 35
Sewell Cushion Wheel Co..... 52
Sterling Top Co..... 75
Sterling Motor Co.....112
Timken-Detroit Axle Co..... 31
Thurber Rotary Starter Co..... 60
Vanguard Mfg. Co.....113
Volkner & Harry Mfg. Co..... 66
Wilson Body Co..... 45
Walter Machine Co..... 54
Walker, H. J., Co..... 77
Zenith Carbureter Co..... 80



¶ A railroad may be likened to an esophagus: It guides products from an origin to the consuming element. In Detroit the different automobile and automobile accessory manufactories have appreciated the importance of being close to this esophagus. The closer to the railroads—the closer to the consumer's pocket-book. This "motor-industrial" map of Detroit shows how the various plants "hug" the vital esophagus.

Automobile, Truck and Accessory Plants



¶ Square blocks represent automobile factories and round dots the locations of accessory plants. All of the railroads that go to form the esophagus are named, and at the base of the arc is that larger "gullet," the Detroit River, which is a cheap and efficient passage to automobile "stomachs" along the Great Lakes. The different plants are numbered and the name of the occupant is listed at either side of the map.

Key to Numbers on Map

1. Ford Motor Co.
2. Maxwell Motor Co.
3. Maxwell Motor Co. (Brush Plant)
4. Herreshoff Motor Co.
5. Briggs-Detroiter Co.
6. Century Electric Car Co.
7. Anderson Electric Car Co.
8. Signal Motor Truck Co.
10. Hupp Motor Car Co.
11. Krit Motor Car Co.
12. Packard Motor Car Co.
13. Cadillac Motor Car Co.
14. Studebaker Plant No. 1
15. Regal Motor Car Co.
16. Scripps-Booth Cycle Car Co.
17. American Voiturette Co.
18. Federal Motor Truck Co.
19. Paige-Detroit Motor Car Co.
20. Studebaker Plant No. 3
21. King Motor Car Co.
22. Abbott Motor Car Co.
23. Standard Motor Truck Co.
24. Universal Motor Truck Co.
25. Lozier Motor Co.
26. Chalmers Motor Co.
27. R-C-H Corp.
28. Hudson Motor Car Co.
29. Commerce Motor Car Co.
30. Detroit Copper & Brass Co.
31. Timken-Detroit Axle Co.
32. Detroit Socket Co.
33. Armitage Leather Co.
34. Kales-Haskel Co.
35. J. N. Smith Co.
36. Hanson Tool Co.
37. Holly Bros.
38. Michigan Lubricator Co.
40. Fisher Body Co.
41. Auto Crankshaft Co.
42. McCord Mfg. Co.
43. Long Mfg. Co.
44. Aluminum Castings Co.
45. Wilson Body Co.
46. Jeffery-DeWitt Co.
47. Dodge Bros.
48. Russell Wheel & Foundry Co.
49. Benham Mfg. Co.
50. Huebner Mfg. Co.
51. Detroit Pressed Steel Co.
52. Sewell Cushion Wheel Co.
53. Michigan Stamping Co.
54. Walter Machine Co.
55. Disco Co.
56. Ross & Young Machine Co.
57. Detroit Heating & Light Co.
58. Detroit Forging Co.
59. Morgan & Wright
60. Thurber Rotary Starter Co.
61. Michigan Auto Trimming Co.
62. Christie-Kline Forge Co.
63. Detroit Gear & Machine Co.
64. Michigan Top Co.
65. Detroit St'r'g Wh. & W'dsh'd Co.
66. Volkner & Harry Mfg. Co.
67. Detroit Screw Wks.
68. Herbert Mfg. Co.
69. Northway Motor & Mfg. Co.
70. Hayes Mfg. Co.
71. Mobile Top Co.
72. Edmunds & Jones Mfg. Co.
73. Gemmer Mfg. Co.
74. Golden, Belknap & Swartz Co.
75. Sterling Top Co.
76. Peninsular Auto Parts Co.
77. H. J. Walker Co.
78. Kelsey Wheel Co.
79. Rands Mfg. Co.
80. Zenith Carbureter Co.
81. Anderson Forge and Machine Co.
82. Continental Motor Mfg. Co.
83. Metal Products Co.
84. Michigan Electric Welding Co.
85. Bower Roller Bearing Co.
86. Motor Foundry and Machine Co.
87. Detroit Lubricator Co.
88. Auto Parts Mfg. Co.
89. Detroit Steel Products Co.
90. Greenslade Oil Co.
92. Monarch Motor Car Co.
93. Saxon Motor Car Co.
94. Ætna Motor Truck Co.
95. American Air Compressor Co.
96. American Blower Co.
97. Berry Bros.
98. Briggs Mfg. Co.
99. Briscoe Mfg. Co.
100. Cross Gear & Engine Co.
101. Day Automobile Co.
102. Detroit Electric Appliance Co.
103. Fisher Electric Works
104. Gen. Aluminum & Brass Cast. Co.
105. Grinnell Electric Car Co.
106. Gray-Hawley Mfg. Co.
107. C. M. Hall Lamp Co.
108. Lavigne Mfg. Co.
109. Mercury Cyclecar Co.
110. Murphy-Potter Co.
111. National Can Co.
112. Sterling Motor Co.
113. Vanguard Mfg. Co.
114. Wagenhals Motor Car Co.

Ford Director Defends Makers' Prices

WASHINGTON, Feb. 19—Since the appearance of Henry B. Joy, president of the Packard Motor company, before the House judiciary committee, other representatives of motor car manufactories have testified before the body in support of fixed retail prices or different phases of proposed anti-trust legislation.

The latest to be heard are Alfred Lucking, a director of the Ford Motor company, and Alvin F. Knobloch, manager of the Northway Motors company of Detroit, Mich., and Boyd Fisher, manager of the Efficiency Society, who introduced Mr. Knobloch, a member of that organization.

Mr. Knobloch objected to a complete, indiscriminate elimination of interlocking directorates, feeling that an interstate trade commission should adjudicate in situations where an interlocking directorate might be an efficient aid in the conduct of a business.

Mr. Knobloch said, also:

"The farmer today is beginning to look toward the agricultural department of our country as a constructive force in his business, and, while it is true that our average farm is only 20 per cent. as efficient as the realized maximum, or 40 per cent. as efficient as the average that is realizable, the manufacturing interests of this country are only 50 per cent. as efficient as the realized maximum. It means that the business man by this constructive relationship to the government can make his local institution more efficient by co-operation through an interstate trade commission. The government should stand in the same relationship to him as the Agricultural Department stands to the agricultural interests.

"The automobile industry has wasted a larger sum of money through preventable waste than it has realized in tangible profits. We are not meeting competition from foreign countries. For instance, America is importing 70 per cent. of its ball bearings which are made in Germany. The reason is that American industries are so inefficient on that article that they are unable to meet the competition of Germany. We are compelled to pay a uniform price to the various manufacturers of ball bearings, and that with the recognition of the German government."

Fixed Price No Aid to Monopoly

Mr. Lucking insisted that he opposed monopoly but contended that where competition was as sharp as in the automobile business, that a fixed, unvariable retail price would not operate to aid a monopoly.

He contended that this proviso should be incorporated in the Stevens bill, now pending before the Committee on Interstate and Foreign Commerce:

Provided, It shall not be unlawful nor held to be a violation hereof for an individual manufacturer or producer or owner of an article to stipulate with his jobbers or retailers, or both, to resell such article only at a price fixed by such manufacturer, producer, owner: *Provided*, This shall not be held to legalize any combination of manufacturers, producers or owners to fix prices or restrain trade.

After reviewing the Ford company's fight against the Selden patent—"a great and lasting victory for open competition"—Mr. Lucking said in part:

"One price to all has not only been the motto of the Ford Co., but we consider it the only truly moral and honest method of doing business. It is the fairest to the public in general and particularly to the poor man and the man without a pull. If one man gets advantage it is bound to come out of others, out of those least able to bear it. This system is regarded by the company as vitally necessary to the successful operation of its business."

"The company's business has been built up to its present proportions by maintaining an organization consisting of dealers in every part of the country—I think about 6,000—who were under contract obligations not only to maintain a garage and a stock of parts for quick repairs, but also to show purchasers how to use and handle and conserve the car, instructing them how to run it, and following and watching every car, remedying defects, and making it please and satisfy the customer. None of these things is done by the cut-price cut-throat, who has no interest in the car or in the business. When by his tricky practices he succeeds in taking customers away from the regular dealer, the Ford company loses its best dealers and salesmen and the car loses its reputation. The purchasers have troubles with the car which could be easily and simply corrected by any person having knowledge, but there is nobody in the vicinity to instruct them. Hence follow dissatisfied customers, loss of the best advertisers (satisfied customers), loss of reputation, loss of sales, and loss of business.

"It would be a brutal injustice, after a dealer has established a garage at a large expense, bought and paid for a demonstrating car, and worked up customers, spending weeks and months of his time and considerable sums of money, to allow some outsider who has succeeded by some trickery in getting hold of some cars, to step in and undersell by 5 or 10 per cent. the regular dealer and take his customers away. Of course, the outsider can afford to cut the price somewhat, when the other man has stood all the expenses connected with working up the sale. After making such sale the outsider has no further interest in the car or the purchaser. He does not instruct the buyer how to use it, or stand ready to remedy slight troubles or defects, or keep the car in good running order, or to do any of the hundred and one things which the regular dealer is glad to do in order to sustain the reputation of the car and build up his own business. If it be told from mouth to mouth that Smith paid $550 for his Ford car while Jones bought the same car about the same time for $500, it is a serious blow to the Ford cars and to the Ford business. It instantly causes the article and the dealer and the manufacturer to fall into disrepute. There is absolutely no danger of extortion under the one-price plan, because if the price is unreasonably high competitors will take the business."

Chairman Clayton asked this question: "While you were reducing the price of the cars the profits of the company were increasing every year, were they not?" To this Lucking replied, "Magnificently, yes, owing to the tremendous output."

Continuing his argument, Lucking said: "In the motor car business the thing of prime importance to the purchaser is continuous, reliable service. This and this alone will satisfy the customer and therefore, this service is absolutely essential to the maintenance of a successful and enlarging business. No method of providing this is known except by contract requirements of the dealer, and in order to get it he must be protected in his territory and a reasonable return must be secured to him.

Maker Must Keep Prices Down

"Competition among manufacturers is such that to live at all, a manufacturer has got to keep his price right down. In Detroit they have been falling by the wayside. Millions have been invested and lost there. I do not know how many failures there were last year, but there were many."

Mr. Lucking mentioned that he is a director in the Rexall company, a pharmaceutical manufacturing concern, and related some of the details of the retailing system of that company.

Ohio's New Law Provides for $5 Fee for Gasoline Cars

COLUMBUS, O., Feb. 21—Just before adjourning *sine die*, the Ohio General Assembly passed a new automobile law, providing for the registering of all motor-driven vehicles on a flat rate basis. The fee for registering electrics will be $3 yearly; for gasoline and steam cars, $5; and for manufacturers $10 and dealers are to pay $20 with $2 for each extra set of plates.

The provisions for the examination and registration of chauffeurs as contained in the Warnes law, declared unconstitutional, were embodied in the new law. Motorcycles are also included in the law and the fee for registering them will be $2 yearly. By a two-thirds vote the law was made effective at once instead of waiting the customary 90 days for referendum proceedings.

This apparently ends the auto registration muddle in the Buckeye state and will not be resisted by the automobile organizations.

Iowa Expects 90,000 Registration

DES MOINES, IA., Feb. 23—Iowa state officials expect the number of automobiles in the state to reach 90,000 this year. They have ordered number plates enough for that many and registrations to date indicate that the estimate is conservative. A total of 46,000 number plates have been issued since Jan. 1 and 24,000 old automobiles are not yet registered.

S. A. E. Announces Committee Schedule

NEW YORK CITY, Feb. 25—The personnel of the standards committee of the Society of Automobile Engineers for the coming year of President H. M. Leland's administration and a program of meetings has just been announced.

There has not been much change in the personnel of the whole committee or in the chairmanships of the various divisions, the principal innovation being the introduction of two new divisions, research and electric vehicle. For the time being the following divisions have been discontinued: Gear Tooth Shapes Division, Joint Standards Division, Technical Index Division and Sheet Metals Division.

The time of the sessions of the summer meetings has now been finally determined by the council and will be as follows:

TUESDAY, JUNE 23
2:00 P. M.—Standards Committee Meeting.
WEDNESDAY, JUNE 24.
2:00 P. M.—Business and professional sessions of the Society.
8:00 P. M.—Entertainment by Sections of the Society.
THURSDAY, JUNE 25.
9:30 A. M.—Professional Session.
2:00 P. M.—Professional Session.
8:00 P. M.—Dinner and European Trip Lecture.
FRIDAY, JUNE 26.
9:30 A. M.—Professional Session.
1:00 P. M.—Adjournment sine die.

The place of the meeting is the new Cape May Hotel at Cape May, N. J.

Schedule of Standards Committee Meetings

All meetings will be held in New York and be called for 9:30 a. m., unless otherwise announced.

PLEASURE CAR WHEELS DIVISION
Tuesday, February 24.
Safe deflection of Q.D. rims under test.
Standard felloe bands for demountable rims.
Minimum possible number of wheel diameters and tires.

TRUCK STANDARDS DIVISION,
Tuesday, March 3.
Discussion of one standard table of carrying capacity of solid tires.
Unfinished matters referred to in last report.
A meeting of the Commercial Car Wheels Division will be held jointly with the meeting of the Truck Standards Division.

IRON AND STEEL DIVISION,
Tuesday, March 10.
Physical tests corresponding to heat treatment of S.A.E. materials.

SPRINGS DIVISION,
Tuesday, March 17.
Cantilever spring
Offset
Brackets
Parallelism
Wrapped Eyes
Clips
What should constitute standard spring
Standard tests
Tolerance in height under load
Rebound clips

BROACHES DIVISION,
Tuesday, March 24.
Four-spline practice.

ELECTRIC VEHICLE DIVISION,
Tuesday, March 31.
The Electric Vehicle Division is a new Division of the Standards Committee created by the Council pursuant to a resolution passed at the last meeting of the Society. The purpose of the Division is to recommend engineering practice in connection with the design, construction and operation of electric motor vehicles. The meeting scheduled above is for the purpose of organizing and laying out the work of the Division.

STANDARDS COMMITTEE MEETING,
Tuesday, Wednesday, Thursday, April 7, 8, 9
Consideration of reports of Divisions and unfinished and new business.
Meetings of the Miscellaneous Division and of the Nomenclature Division as well as of all the active Divisions of the Standards Committee will be held some time during the three days of the above mentioned meeting of the Standards Committee.

RESEARCH DIVISION,
Tuesday, April 21.
Procedure to be determined by the Council and Division.

ELECTRICAL EQUIPMENT DIVISION,
Tuesday, May 5.
Single wire versus complete wire circuits.
Electric motor and generator base dimensions.
Temperature test.
Insulation.

BALL AND ROLLER BEARINGS DIVISION,
Tuesday, May 12.
Topics to be determined.

MOTOR TESTING DIVISION,
Thursday, May 14.
Formulation of Scientific tests, etc.

Standards Committee of the Society of Automobile Engineers—Henry Souther, Chairman

ALUMINUM AND COPPER ALLOYS
William H. Barr, Lumen Bearing Co., *Chairman.*
Jerome J. Aull, Lunkenheimer Co.
Geo. W. Dunham, Chalmers Motor Co.
E. S. Fretz, Light Mfg. & Foundry Co.
Geo. M. Holley, Holley Bros. Co.

BALL AND ROLLER BEARINGS
Howard Marmon, Nordyke & Marmon, *Chairman.*
David Fergusson, Pierce-Arrow Co.
F. M Germane, Standard Roller Bearing Co.
B. D. Gray, Hess-Bright Mfg. Co.
E. G. Hughes, New Departure Mfg. Co.
F. J. Jarosch, J. S. Brets Co.
M. T. Lothrop, Timken Roller Bearing Co.
A. L. Riker, Locomobile Co.

BROACHES
C. W. Spicer, Spicer Mfg. Co., *Chairman.*
J. F. Barr, Gear Grinding Machine Co.
F. L. Eberhardt, Gould and Eberhardt.
Ralph R. Lapointe, Lapointe Machine Tool Co.
G. E. Merryweather, Motch & Merryweather.
C. Peck, Cleveland, Twist Drill Co.
G. A. Weidely, Premier Motor Mfg. Co.

CARBURETER FITTINGS
G. G. Behn, Hudson Motor Car Co., *Chairman.*
Jerome J. Aull, Lunkenheimer Co.
George M. Holley, Holley Bros.
Howard Marmon, Nordyke & Marmon.
C. W. Stiger, Stromberg Motor Devices Co.
E. E. Sweet, Cadillac Motor Car Co.

COMMERCIAL CAR WHEELS
Wm. P. Kennedy, *Chairman.*
J. A. Anglada.
H. D. Church, Packard Motor Car Co.
C. B. Hayes, Hayes Wheel Co.
Russell Hoopes, Hoopes Bros. & Darlington, Inc.
A. M. Laycock, Axle Department, Sheldon Axle Co.
J. Morat, I. G. Johnson & Co.
A. J. Scaife, The White Co.
A. J. Slade.
Charles L. Schwarz.
E. R. Whitney, Commercial Truck Co.
C. B. Whittelsey, Hartford Rubber Works Co.

DATA SHEET
B. D. Gray, Hess-Bright Mfg. Co., *Chairman.*
A. M. Dean, Palmer & Singer Mfg. Co.
J. H. Hertner, Rauch & Lang.
Wm. V. Lowe, Hess-Bright Mfg. Co.
Harold L. Pope, Pope Mfg. Co.
Henry Souther, Standard Roller Bearing Co.

ELECTRICAL EQUIPMENT
A. L. Riker, Locomobile Co., *Chairman.*
V. G. Apple, Apple Electric Co.
G. G. Behn, Hudson Motor Car Co.
W. L. Bliss, U. S. Light & Heating Co.
C. M. Bunnell, General Electric Co.
W. H. Conant, Gould Storage Battery Co.
Frank Conrad, Westinghouse E. & M. Co.
David Fergusson, Pierce-Arrow Co.
Edward A. Halbleib, North East Electric Co.
Russell Huff, Packard Motor Car Co.
Leonard Kebler, Ward Leonard Electric Co.
Alden L. McMurtry.
R. J. Nightingale, Willard Storage Battery Co.
Wm. H. Palmer, Jr., Electric Storage Battery Co.
G. R. Wadsworth, Gray & Davis.

ELECTRIC VEHICLE
J. R. Coleman, Atterbury Motor Car Co.
R. S. Fend, Woods Motor Vehicle Co.
Emil Gruenfeldt, Baker Motor Vehicle Co.
J. H. Hertner, Rauch & Lang.
Benj. Jerome, Couple Gear Freight Wheel Co.
Wm. P. Kennedy.
J. M. Lansden, General Motors Truck Co.
Ernest Lunn, Walker Vehicle Co.
A. J. Slade.
W. J. B. Thomas, Century Electric Car Co.
P. D. Wagoner, General Vehicle Co.
C. A. Ward, Ward Motor Vehicle Co.
E. R. Whitney, Commercial Truck Co.

FRAME SECTIONS
J. G. Perrin, Lozier Motor Co., *Chairman.*
C. E. Clemens, Perfection Spring Co.
A. L. Riker, Locomobile Co.
W. R. Strickland, Peerless Motor Car Co.

IRON AND STEEL
Henry Souther, *Chairman.*
W. P. Barba, Midvale Steel Co.
F. D. Carney, Pennsylvania Steel Co.
E. L. French, Sanderson Bros. Wks., Crucible St. Co.
G. F. Fuller, Wyman & Gordon.
Arthur Holmes, H. H. Franklin Mfg. Co.
J. A. Mathews, Halcomb Steel Co.
George L. Norris, American Vanadium Co.
J. H. Parker, Carpenter Steel Co.
E. F. Russell.
C. F. W. Rys, Carnegie Steel Co.
Thomas Towne.
F. W. Trabold, J. H. Williams & Co.
K. W. Zimmerschied, General Motors Co.

LOCK WASHER
J. E. Wilson, National Lock Washer Co., *Chairman.*
C. E. Davis.
E. W. Hart, Hobbs Manufacturing Co.
F. S. Sayre, Positive Lock Washer Co.

MISCELLANEOUS
John G. Utz, Perfection Spring Co., *Chairman.*
G. G Behn, Hudson Motor Car Co.
Herbert Chase, Automobile Club of America.
E. H. Ehrman, Chicago Screw Co.
David Fergusson, Pierce-Arrow Co.
Arthur Holmes, H. H. Franklin Mfg. Co.
N. B. Pope, Automobile Topics.
A. L. Riker, Locomobile Co.
E. E. Sweet, Cadillac Motor Car Co.

MOTOR TESTING
J. O. Heinze, Northway Motor & Mfg. Co., *Chairman.*
R. C. Carpenter, Cornell University.
Herbert Chase, Automobile Club of America.
H. L. Connell, Engineering Laboratories Co.
Geo. W. Dunham, Chalmers Motor Co.
J. A. Moyer, Pennsylvania State College.
W. G. Wall, National Motor Vehicle Co.

NOMENCLATURE
Arthur B. Cumner, *Chairman.*
A. L. Clough.
H. E. Coffin, Hudson Motor Car Co.
T. J. Fay, Rockfeller Motor Co.
P. M. Heldt, Horseless Age.
W. C. Marshall.

PLEASURE CAR WHEELS
Henry Souther, *Chairman.*
H. L. Barton, General Motors Co.
R. S. Bryant, Standard Welding Co.
C. C. Carlton, Firestone Tire & Rubber Co.
E. R. Hall, Goodyear Tire & Rubber Co.
Howard Marmon, Nordyke & Marmon.
J. G. Vincent, Packard Motor Car Co.
C. B. Whittelsey, Hartford Rubber Works.
C. B. Williams, Mott Wheel Works.

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R. C. Carpenter, Cornell University.
Walter T. Fishleigh, University of Michigan.
Charles E. Lucke, Columbia University.
James A. Moyer, Pennsylvania State College.
H. F. Thomson, Massachusetts Inst. of Technology.
C. B. Veal, Purdue University.

SEAMLESS STEEL TUBES
H. W. Alden, Timken-Detroit Axle Co., *Chairman.*
H. L. Barton, General Motors Co.
J. Jay Dunn, Shelby Steel Tube Co.

SPRINGS
Harold L. Pope, Pope Mfg. Co., *Chairman.*
Christian Girl, Perfection Spring Co.
David Landau, Sheldon Axle Co.
Ralph L. Morgan.
W. N. Newkirk, William & Harvey Rowland, Inc.
Mason P. Rumney, Detroit Steel Products Co.
A. C. Schulz, Locomobile Co.

TRUCK STANDARDS
Wm. P. Kennedy, *Chairman.*
B. B. Bachman, The Autocar Co.
H. D. Church, Packard Motor Car Co.
C. E. Clemens, Perfection Spring Co.
A. H. Ehle, Baldwin Locomotive Co.
Bruce Ford, Electric Storage Battery Co.
W. A. Frederick, Continental Motor Mfg. Co.
Robert McA. Lloyd.
C. T. Myers.
W. H. Roberts.
E. F. Russell.
C. L. Schwarz.
F. W Trabold, J. H. Williams & Co.
E. R. Whitney, Commercial Truck Co.
C. B. Whittelsey, Hartford Rubber Works Co.

Making a Wire Wheel

Being the Story of the Manufacture of 3,750 to 5,000 Wire Wheels a Day in the Plant of the Houk Mfg. Co.

By L. V. Spencer

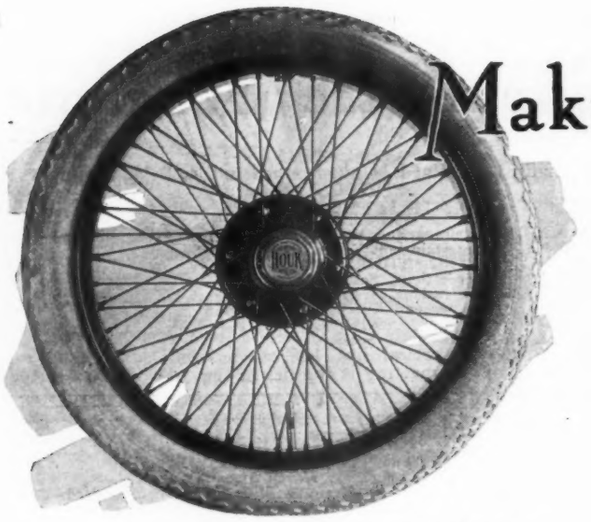


Fig. 1—The finished product. A Houk wire wheel

BUFFALO, N. Y., Feb. 21—The making of wire wheels in this country on any sort of a large production basis is a comparatively new thing. But with the increasing demand for them, not only for use on standard types of automobiles, but on light cars and cyclecars as well, the wire wheel manufacturers have been encouraged to increase their facilities for turning them out.

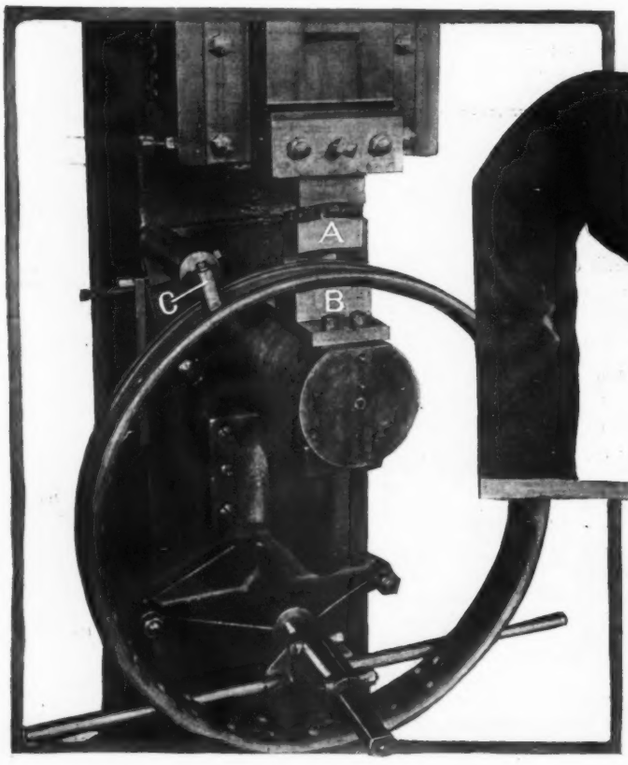
The use of wire wheels would have shown even greater gains during the past year, without doubt, had there been any quantity production of them. But they have been hard to get heretofore and consequently the wire wheel movement has been handicapped.

One wire wheel maker, at least, is today in position to produce daily from 750 to 1,000 sets of wheels, a set generally being considered as consisting of five wheels. This is the Houk Mfg. Co., Buffalo, which is producing for the Geo. W. Houk Co., licensed under Rudge-Whitworth, a type of wheel known as the Houk which comes under the English concern's patents.

There is always more or less delay and confusion attendant upon the taking over of a factory or the organization of a manufacturing proposition on a production basis. When the Houk company took over the McCue plant at Buffalo last fall, it was confronted with this problem, and during the succeeding months has been organizing and equipping for large output. This development period has now been passed and the visitor to the plant today sees a perfected working organization busily engaged in the actual making of nearly 5,000 wire wheels a day with the aid of special machinery and factory efficiency.

Stock Ready for Use

The floor area of the factory is about 90,000 square feet and besides the machinery and other manufacturing equipment, this provides space for a large stock room, the wire wheel parts and completed wheels in which run into big figures. There are about 2,000,000 spokes and nipples, 4,000 rims perforated ready to re-



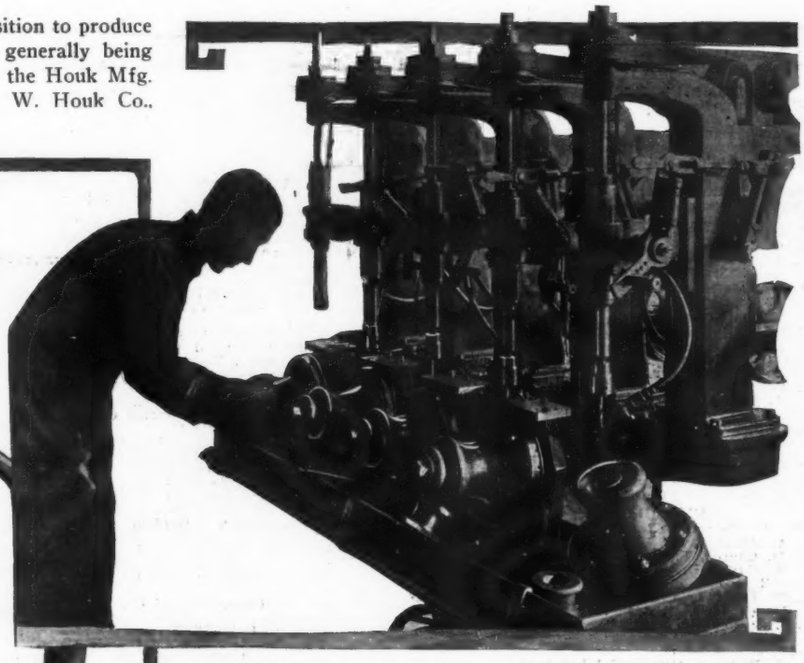


Fig. 2—One of the five spindle automatic gang drills used in the Houk factory for drilling spoke holes in outer hub. It has spindles on its table on which the hubs are mounted, while an indexing attachment revolves it a given distance after each hole has been drilled, thus equally spacing them. The machine finishes one of the five hubs each 3 minutes

Fig. 3—Indenting the rim for the nipple heads at the Houk plant. One of a series of punch presses on which this process is done all around a rim in 1 minute. The machine has a die with upper and lower halves A and B. The round ended plungers in the upper part mate with concaved portions in the lower part. C is the index finger

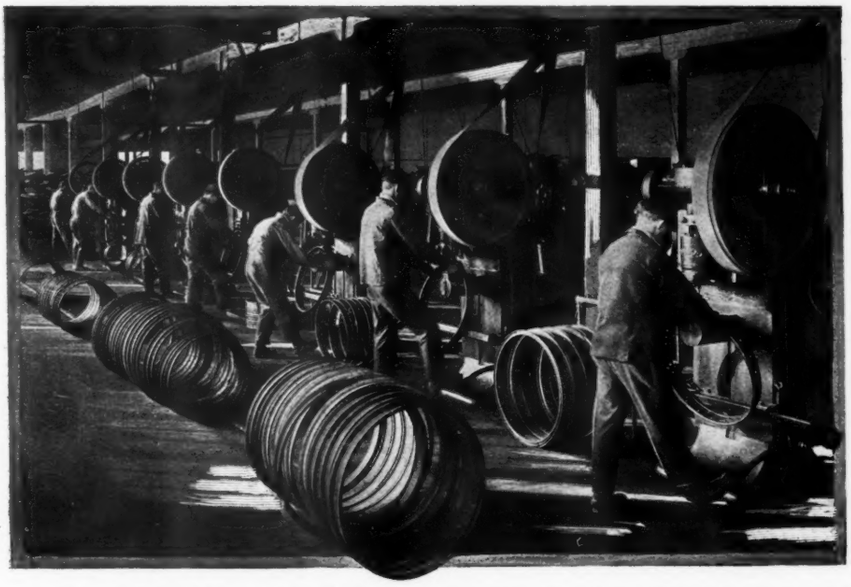


Fig. 4—Preparing standard rims for the reception of spokes. Gang of punches and indenting machines on each of which the rate of production is one rim per minute. The rim is first indented all around by press carrying an indexing device. It then passes to the punch where these indentations are used as the marks for the punch holes. The indentations serve the same purpose as the countersinking for screw heads in other classes of machining, these indentations taking care of the nipple heads so that they will not protrude above the rim surface

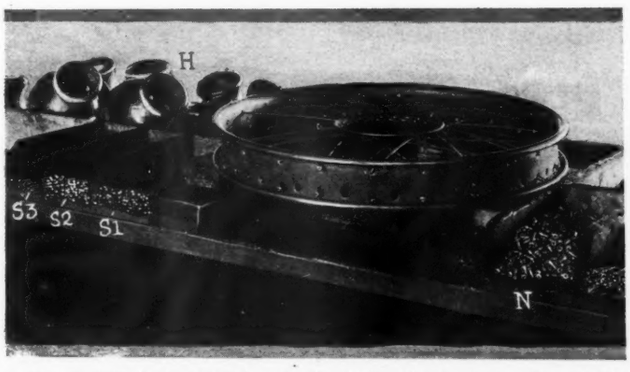


Fig. 5—Efficient assembly stands at the Houk plant. The blocks in the center are arranged for the resting of rim and hub, while all necessary lengths of spokes and nipples are arranged conveniently to the assembler in the compartments, N, S1, S2 and S3. Hubs are placed in the larger compartments at H. This is a good example of efficiency in assembly, and reduces the number of motions necessary to the minimum

ceive the spokes, 6,000 rims not yet perforated, 10,000 inner hubs, 100,000 drive pins, and 1,500 finished wheels disposed in various parts of the stock room.

The new Houk plant gives employment to about 700 men.

The Houk wire wheel consists essentially of an inner and an outer hub, a clamping nut, rim and spokes. Fig. 1 shows the wheel ready for the road, while the small diagram inset in Fig. 8 gives an idea of the triple-spoke lacing used. This is a part of the Rudge-Whitworth patent under which the Houk wheels are made.

Single Automatic Locking Nut

The inner hub has six driving pins which go through mating holes in the inner face of the outer hub, connecting inner hub and the rest of the wheel for driving purposes. The holes in the flange of the outer hub are provided with bosses to take the driving strain. To clamp the wheel proper to the inner hub, the Houk construction uses only a single automatic locking nut. The outer hub bears on the inner at two points. The inner of these is a part of the inner hub, while the latter is a part of the locking nut. When this locking nut is screwed onto the threaded end of the inner hub, the outer hub gets its outer bearing. Both of these bearing surfaces are inclined in opposite directions, so that, as the nut is screwed on, they are brought closer together, clamping the wheel in place.

Locking Device Simple and Positive

The special feature of the wheel is the simplicity and positiveness of this locking device. The taper portion of the nut is slotted into segments which allow it to be slightly compressed when forced into the conical seat of the hub shell. Further, the thread is so cut that it will be a loose fit on the fixed hub, and the slight difference in diameter between these two thread portions makes a difference in the circumferential length of the threads.

Thus when the nut is screwed on and the wheel bears a part of the weight of the car, the pressure is conveyed to the taper portion of the nut in theoretical line contact. When the whole assembly turns due to the forward motion of the car, the clamping nut also turns, being carried forward by this line contact. Due to the wedging together of the threads under the load pressure, slippage between the threads is prevented and the nut is therefore forced to lag somewhat behind the other hub parts. This causes the nut to screw itself onto the threads automatically until such time as the nut has been screwed far enough for the conical portion to have an inner or threaded diameter equal to that of the fixed hub. Then the creeping action ceases, for the forces tending to cause the nut to lag are equaled by those of the line contact, and the nut really floats. In other words, the threads clamp together in the conical end of the hub to prevent further screwing up. After this differential creeping action has stopped, backing up the car does not loosen the nut, a wrench being needed to unlock it.

This explanation will suffice to show why the number of parts of the Houk wheel is so small and how they are used to answer the purpose to advantage.

Drilling the Outer Hub

In the actual making of these wheels at the Houk factory, one of the first operations is the drilling of the outer hub or shell for the spoke heads. Two series of these spokes run to the inner flange of this hub, while the outside or thrust spokes extend to the outer end of the hub. The hub comes to the factory in the finished form with the exception of the drilling, and is a steel stamping which has required twenty-three press operations to finish it from the flat plate from which it was formed.

Fig. 2 shows the specially set-up gang drill on which the drilling of the spoke holes is done. The hubs are set up on holders on the drill table. These holders have spindles to take the hubs, while a driving pin is also provided which goes through one of the driving holes in the hub. An indexing attachment revolves the hub on this spindle a given distance putting it in position for another hole to be made after each drilling operation, until the entire flange circumference has been provided with the properly spaced holes. Thus, after the hub has been put in place on the machine, the operator has only to start the machine, when the holes will be drilled in proper relation to one another. By the use of five drills working together as shown, the machines have a large capacity. One hub comes off each machine every three minutes.

Fig. 6—Assembly of the wire wheel. A section of the spoke lacing and tensioning department of the Houk plant, where hubs, spokes and rims meet to make wheels

As to the inner hubs, these come to the factory in the rough form and require in the Houk plant only the various machine operations necessary to finish the inner taper surface, to thread the end for the nut, to drill the holes for the steel driving pins, and for the bolting to the brake drums in the case of the rear hubs. These operations are all standard machine shop processes and need no special comment.

Rims used in the make-up of these wheels are Stanwelds, and are received in the standard form just as they would be used in any wood wheel construction. But they must be prepared for the wire spokes and this is a very interesting process. Two kinds of operations are necessary to first indent the rim surface at equally spaced points around the rim and then to punch holes for the spokes in the center of these indentations.

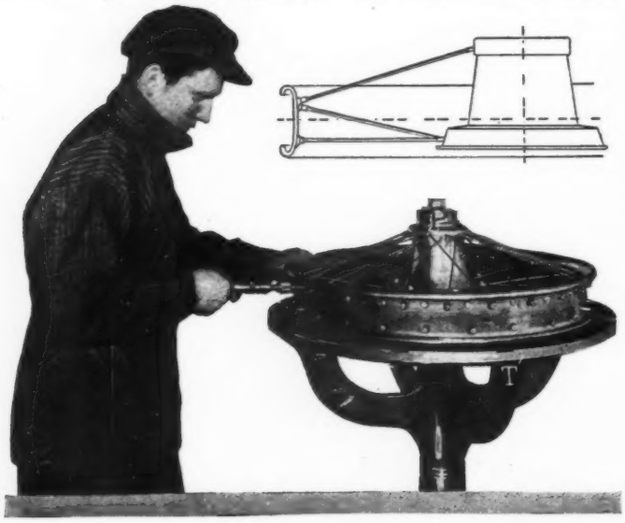


Fig. 7—Screwing up the nipples on the ends of the spokes to tension them. The flexible shaft screw driver arrangement is so constructed that it slips when a certain tension has been reached and will not further turn the nipple, thereby assuring even tension on the spokes. To cause the rim and hub to be properly positioned with respect to one another, the correct position of the hub is located by the spindle P over which it fits, while the rim is positioned by adjustable blocks on the table T, which bear against the inner surface of the rim. Table and spindle are free to revolve independently of each other, allowing rim and hub to adjust themselves to the tension. The upper illustration shows the triple-spoke lacing used

A battery of eight punches takes care of this part of the wheel making. The first two or three are set up for the indenting process, while the others punch out the holes so marked by these indented points. The standard rim is laid on the punch between the two halves of the die, as seen in Fig. 3. The upper part of the die A has three round ended plungers which sink into mating cavities in the lower plate B and when the rim is interposed between them, it receives the desired dents.

These are in a series of three to receive the three spokes which come in groups, so to speak. Naturally, the indentations must be equally spaced around the rim, and to do this there must be a special die for each size of rim so that its punch marks will come a predetermined distance from one another in order that the spacing will come out even, and besides this an indexing attachment C is used which locates the distance the rim must be shifted after any set of three dents has been made. This index C has a spring plunger which drops into one of the holes when the rim is shifted, and this shows that the spacing is right for the next set of marks. It takes about one minute to dent the rim all the way around.

Punching the Spoke Holes

Having thus located the spoke holes in the rim, the next operation is the actual punching of them. This is done with another of the punch presses, Fig. 4, one hole at a time, in the center of the indented points. The operator requires 1 1-2 minutes to perforate a marked rim. When this is done, the holes have the same appearance as if they had a bevel countersink, the indentations being large enough to take the heads of the nipples so that they will be flush with the rim surface when assembled.

On the Assembly Limited

All parts are now ready for the assemblers. Special benches are provided for this work, and the arrangement of the parts entering into the product is noteworthy. Fig. 5 will serve to bring this out. The assembly block on which the rim and hub are laid is in the center as shown, and the three different lengths of spokes S1, S2 and S3, are placed in little compartments to the left and the nipples in one at the right at N. Another and larger compartment holds the hubs as seen at H.

Thus the assembler does not have to move from his position

in putting the wheel together, which is an example of efficiency well worth noting. Back of the bench are a number of perforated rims. One of these is put on the bench, then a hub is taken from the pile, following which the lacing takes place and the nipples are started. The number of spokes per wheel varies according to the design and size. A No. 5, for instance, has from 66 to 72 spokes, and a No. 4 takes 60. Some of the lighter wheels have only 48. The assembler does not put any tension on the spokes, but simply gets the parts together in the proper relation to each other.

Even Tension on the Spokes

Obviously, it is important in the tightening of the nipples that they all place the same tension on the spokes which they hold. Otherwise, the wheel would be warped, or out of shape. Special tables are provided for this work as seen in Fig. 7. The assembled wheel is laid on this with the hub on the spindle P which is free to revolve. The rim lies on the outer table T which may turn independently of the inner spindle. Equally spaced blocks on this table which may be set for any given rim diameter, rest against the inner surface of the rim. With these in place and the hub held down by the nut on the top of the spindle, rim and hub are properly positioned with respect to one another, and the spokes may be tightened up. To do this, a revolving flexible shaft with which the operator is working is used. This has a driving end to engage the nipple head, and screws it up until a certain tension is reached in the spoke, when it will not turn the nipple any further.

First the tangential or driving spokes which lead to the outside edge of the rim are tightend up. This has the effect of drawing the rim down tightly against the positioning blocks of the table. Then the tangential spokes running to the inside of the rim are tightened, and finally the outside or thrust spokes are adjusted. To tighten all the spokes of a wheel requires about 5 minutes with the automatic screw driver.

The wheel next goes to the inspector and any protruding ends of spokes are then ground off on a grinding wheel having a special attachment for holding the wheels, after which the now completed product goes to the enamelling room where it is dipped and then baked to set the color.

Recent Court Rulings

By George F. Kaiser

IN a recent Texas case a motorist had left his car at a garage for repairs with the understanding that the charges were not to exceed $100. After the repairs were finished he took the car out on a trial spin but then returned it to the garage and left it there until a shower which had come up should stop. On going back later he was not allowed to take the car out. The repair man demanded that he first pay the repair bill of $196.62. Finally, to get the car, he gave his check in that amount but immediately stopped payment on the same, whereupon the repair man started suit against him. The court held: that as the motorist gave his check in order to obtain possession of his own property which was wrongfully withheld from him he was entitled to relief and the repair man could not recover the face amount of the check but was only entitled to recover up to the amount agreed upon.—Caldwell vs. Auto Sales & Supply Co., 158 S. W. 1030.

Chauffeur Responsible

In the State of Washington, the father of a chauffeur received permission from the wife of a car owner to send the car for a doctor. The trip from the doctor's office to the home of the sick person and the return to the office were safely made. After the doctor had left the car the chauffeur met a lady friend who had just missed a street car. He offered to overtake the car for her and did. After leaving her he ran down a pedestrian. The Court held, that the chauffeur was not driving for the owner of the car at the time of the accident but for his own father and the mere fact that defendant admitted to a witness that he was the owner of the car and that he employed the chauffeur to drive it, merely put the burden on him to show that the chauffeur was not engaged in his business at the time of the accident, and that having shown that, he was free from liability and the suit against him should be dismissed.—Luddberg vs. Barghoorn, 131 Pac. 1165 (Sup. Court, Washington, May 7, 1913).

Fig. 5—The realm of the wire wheel. Several thousand wire wheels in the making in the plant of the Houk Mfg. Co., Buffalo. The manufacture of wire wheels in this country on a large scale is a comparatively new industry. Finished wheels are seen in the foreground, while the background is largely taken up with huge piles of hubs

Fig. 1—With a 400-pound weight under the spring a bump will throw the rider off

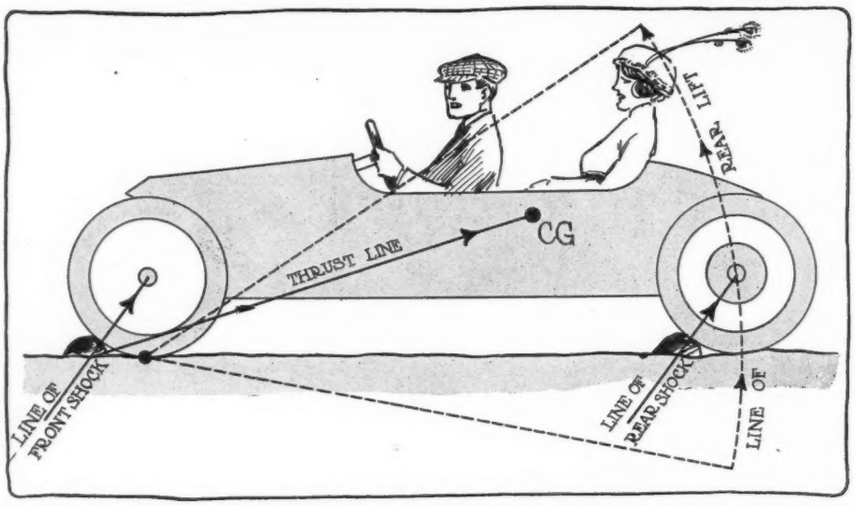


Fig. 2—Showing the lines of thrust and lift which must be taken into account in designing cyclecar springing systems, lines too often being ignored by amateur builders

Cyclecar Springing

Springs Must Be Light and Very Resilient—Proper Location of Center of Gravity

OUTSIDE of the power plant the springing of a cyclecar is the most important feature of design. There are many points where the springing of these new vehicles varies from big car practice, and hence the man used only to big car work must go a step further in spring theory.

As to a car's comfort, no matter what its size or weight, this is due to the relation of weights rather than the total weight of the car, and the springs act merely as absorbers of shocks and to give a time element to quick displacements of weights. The less weight that is suddenly displaced the less reaction the springs will be called upon to absorb, so that the subject of springing is bound up in the matter of balance and unsprung weight.

Under-and-Over Ratio Counts

The public believes that to be comfortable a car must be big and that to hold the road at speeds it must be heavy. The low-built, minimum-unsprung-weight cyclecars are proving that the total weight has little to do with comfort or holding-the-road ability; it is the ratio between that weight under the springs and that over the springs.

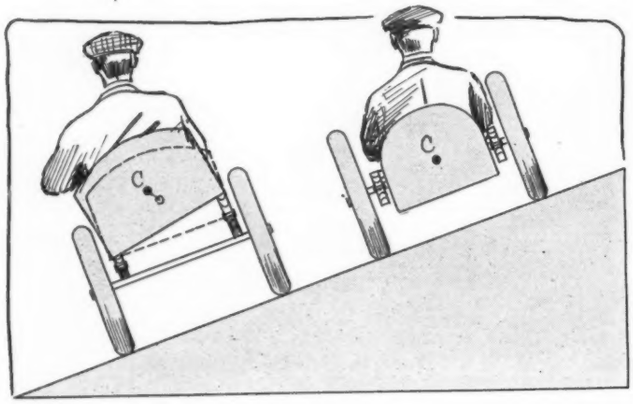


Fig. 3—Showing the effect of high weight center on springing system and car roll. Cyclecars run at steep angles and springing systems must take care of the strains thus caused

Suppose a man weighs 150 pounds and is sitting over a 400-pound weight with a resilient spring between, Fig. 1. Suppose that the weight below is suddenly thrown up 4 inches. No matter what the design of the springs or how efficient the shock absorbers the man will be thrown from the spring, by its reaction against the weight, for there is almost three times his own weight below the springs. If a 400 pound axle-wheel-differential outfit is below the springs of a car then the bigger and heavier the car body above, the easier riding will be the car and the more expensive to run.

In this heavy-axle type the spring itself can do little to eliminate discomfort, for a violent shock will throw the passenger from the seat. The springs can distribute a shock and distribute it over a period of three times the period of the actual action of displacement, but with the heavy weight type the spring is so stiff to take the big shocks, that it needs auxiliary devices for the small road shocks, so that springing is a compromise between big and little bumps and as to which shall be absorbed.

If the springs are too long and free that only makes the throwing effect greater when a bump is met.

Small Weight Under Spring

When the weight below the springs is small the weight of the person above will be the same and the weight below that of the average cyclecar rear axle and wheels, say 50 pounds. The 50 pounds below the springs can bob about considerably—it has a relation of only 1 to 3 instead of the 3 to 1 ratio in the first example—so that the lower diagram should and does give many times the comfort.

The light weight of 50 pounds cannot throw the 150-pound weight very far, no matter what the shock, so that the springs in this case can be very flexible and resilient, answering to the least road shock and yet not fail when big bumps are met. The springs in this case need no shock absorbers nor auxiliary devices for small shocks. They can be almost as resilient as baby carriage springs, so the car design allows it.

Get Center of Gravity Low

Fig. 3 shows the relation of the position of the center of gravity C to the springing system. The left car has the weight high, and when the car leans on an incline as illustrated, the lower spring gets all the thrust, and the body rolls, as indicated by dotted lines. This car when running on a rough road will get a bump first on one side and then on the other and will start to roll back and forth with a pendulum action. This will necessitate the fitting of heavier springs on this type, and hence allow not nearly so easy riding.

The right car has underslung frame and the weight very low. The thrust is here almost directly sideways and the same on both springs so that there is no rolling except of axles. This seating position is much more comfortable than high seating, gives easier, more flexible spring possibilities, and is to be preferred. The dot shows the center of gravity in each case.

Favors Cantilever Springs

On the first type of car there are certain types of springing, which will limit the comfort of the car. A car of this type should not have long quarter-elliptic springs for if these are made long to get the range of action, they are likely to have a side sway when there is a thrust sideways like that shown on the incline. The effect on the springs is one of distortion as in Fig. 5 and shows why for cyclecar work where these steep angles are often met the Lanchester or cantilever type is better, for rear springing at least, than the quarter elliptic.

The cross-spring construction used by several cars, and by some only at the front, has a great advantage in that there is no side sway, and the wheels hold the body from rolling, that is when they are rotating. This is an excellent construction for front springs but has hardly enough spring length for rear spring work. The statement that the tires roll sideways when the springs act while correct in theory, is not a fact in practice as the springs are made flat, and in one case the shape of the spring is such that its action is really vertical. The roll does not amount to more than 1-8 inch in any case which is negligible.

In one case the springs of this type are pivoted, giving a three-point suspension, Fig. 4. This arrangement has very great advantages of comfort outside of a slight reaction in steering, but requires a stiff frame to hold the parts in real line.

Great Resiliency Required

The resiliency of a cyclecar spring should be much greater than on big machines. Spring makers have found that the average cyclecar maker orders springs stiffer when he comes to manufacture than he orders for his first car, and as a rule they generally make the springs a little stiffer than ordered. This change may be right, but a large number of machines would be much easier riding and better machines if the springs had been left as in the beginning and the car developed to fit the springs. In most cases where springs have been stiffened, the reason has been that the center of gravity was too high at the rear. This caused a car wonderfully easy riding on the straightaways to roll on the corners to such an extent that the springs had to be strengthened. If the weight had been lowered instead the springs could have been left and the easy riding continued, whereas in some of the cars now running, so far as spring comfort is concerned, side-by-side seating could be used without any lean with one in.

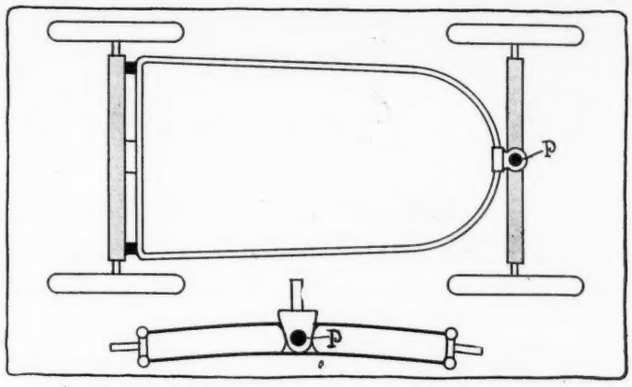


Fig. 4—Three-point suspension as used on the Falcon cyclecar. The front axle pivots on a pin at P

To test the springs by getting inside and jumping up and down is not a real criterion.

Given proper springing and a 50-pound rear axle a tandem cyclecar can go over a rough road at 40 miles per hour where a big car has to slow to 15 to keep the rear passengers in the seats.

Amount of Action Needed

The cyclecar, however, must have a spring action range as great as on a big car, say 3 1-2 inches for the front springs and 5 inches for the rear. The front springs of a cyclecar should be about half again as stiff as the rear ones.

The front wheels take the fore-and-aft shocks and the rears the vertical, Fig. 2. Here C.G. is the center of gravity of the car, and the jar when a bump is hit travels along the line from the point of contact of the bump to C.G. The jar to the front springs extends from the point of contact to the hub as shown by the line of front shock. The shock at the rear lifts on a curve the center of which is the point of contact of the front wheels with the ground as shown. The action of the rear springs is through a vertical arc but the thrust line is again from the point of contact with the bump, to the hub as shown. This line of shock at both front and rear shows why it is an advantage to slant the springs to the rear in both cases. The front springs ordinarily are not fixed in this manner, however, for structural reasons and because the front springing is not as important for comfort as the rear.

The ordinary type of cross-spring with axle, as used on cheap small cars, is not as well fitted to cyclecar use as to big car use, as the length available does not give the range of action necessary for heavy road work. Comfort can be obtained, but the aim is to attain to maximum comfort.

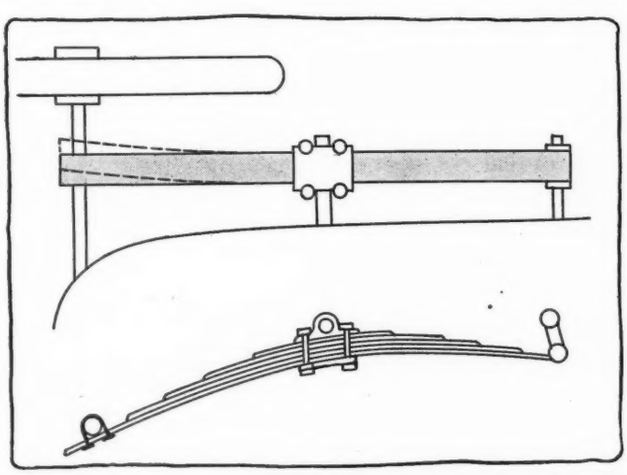


Fig. 5—This type of cantilever spring for cyclecar use has the advantage of less sidesway than the type shown in Fig. 6, though it is more expensive

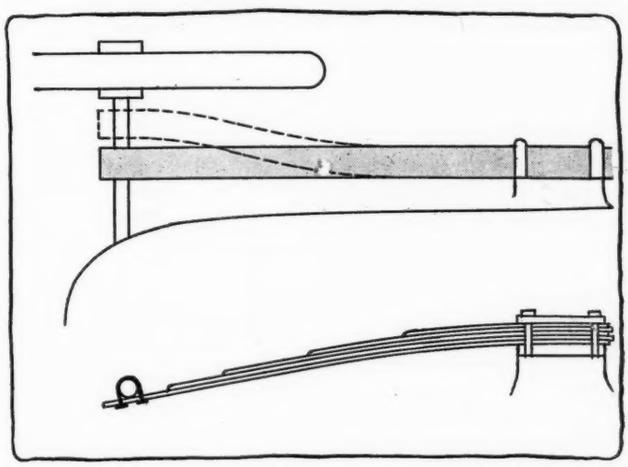


Fig. 6—This type of cantilever springing has the advantage of being less expensive than that illustrated in Fig. 5, but has more sidesway

The Automobile Engineers' Forum

Chief of Firestone Service Department Emphasizes the Importance of Keeping Tires Inflated Properly—Engineer Urges Improvement in Fender Design for Protection Against Mud and Water in Bad Weather

AKRON, O.—Editor THE AUTOMOBILE:—There are so many different factors having an influence on the usage of tires that no rule for inflation can be adopted which will be exactly suitable to all conditions. Style of car, construction, the weight and its distribution, power, road conditions, speed, the expert or careless driver, effect of climate and numerous other things all have important connections with the strains to which the tires will be subjected. Consequently a fixed rule for inflation would, in view of these things, produce different results.

Rules for Proper Inflation

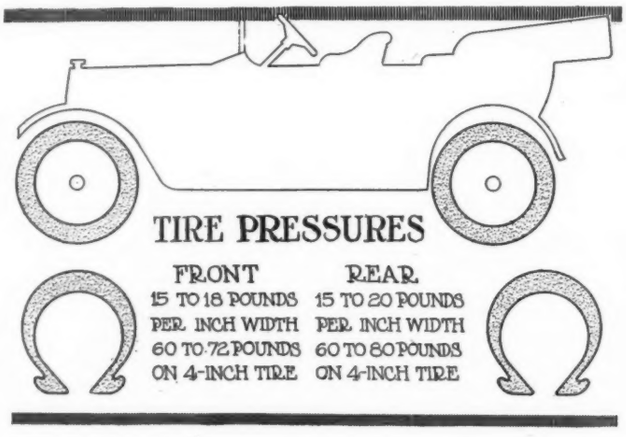
The schedules of inflation recommended by the tire companies provide a basis from which to work. Ordinarily the tires on front wheels should be inflated from 15 to 18 pounds per inch of tire section and the rear tires from 15 to 20 pounds per inch of tire section. For example: 4-inch tires on front wheels from 60 to 72 pounds and the rear from 60 to 80 pounds. The variation in these pressures naturally depends upon the things before mentioned, principally the weight of car. For instance—tires on a car weighing 1,800 pounds do not require as much air pressure as the tires on a car weighing 2,500 pounds. The tires ride hard when pumped up to a high pressure and used on light cars but with the same pressure ride comfortably on a heavy car.

Weigh Car in Fitting Tires

In determining the correct size of tire and the proper inflation, it is important to know the weight of car and distribution on the front and rear wheels. Run front half of car on platform scales and make note of the weight. Then place only the rear half of car on scales and record this weight. The weight carried by each tire will be one-half of either of the respective amounts.

Resiliency is primarily governed by the construction and quality of the tires but is largely influenced by the inflation and the weight carried. A 4-inch tire inflated to 70 pounds pressure and carrying a weight of 800 pounds will naturally ride easier than the same size tire with the same inflation carrying a weight of 700 pounds. The heavier weight causes some deflection of the tire on the ground and increases the action adding to the comfort of the ride. As the deflection or flattening of the tire is increased either by weight or reducing the air pressure, most of the vibration is absorbed by the tires and not by the springs of the car. The danger is in going to an extreme, and a great many car owners, in this way, sacrifice tire efficiency and maximum mileage.

If you find the tires ride hard when inflated to 80 pounds pressure, it is safe to reduce the pressure to 75 pounds or 70 pounds, providing this does not permit the tires to bulge or flatten under the weight imposed by the car.


TIRE PRESSURES
FRONT
15 TO 18 POUNDS PER INCH WIDTH
60 TO 72 POUNDS ON 4-INCH TIRE
REAR
15 TO 20 POUNDS PER INCH WIDTH
60 TO 80 POUNDS ON 4-INCH TIRE

Use the Pressure Gauge

Don't make the mistake of guessing at the inflation from appearances; use a tire pressure gauge at least every week—the tires sometimes appear to round up pretty well but when tested with the gauge you may find the pressure is entirely too low to secure the best results.

A great many tires are damaged in a number of ways from under-inflation. This is particularly the case during the summer season. Tire users seem to be under the impression that there is danger of blowouts due to expansion. There is some expansion but, as a matter of fact, it is not in proportion to the increase in temperature. For example: if the temperature of the air in a tire increases from 60 to 80 degrees it does not mean that the air pressure per square inch increases from 60 to 80 pounds. With the change in temperature mentioned, it actually results in an increase of 3 pounds pressure per square inch, that is, if the temperature of the air in a tire increases from 60 to 80 degrees the air pressure increases from 60 to 63 pounds.

Tire Flexing Raises Temperature

On a hot day it will be observed that driving a tire soft for some distance over a brick pavement will heat it considerably more than the tires upon the opposite wheel inflated to a higher pressure. This is caused naturally by the increased bending in the side walls of the soft tire and the increased road friction due to deflection. The excessive bending and heating is detrimental in many respects. The deflection and wave in front of the tires requires more power from the engine. The kneading action results in separation of the rubber cover from the body and the several plies of fabric in the body do not take bumps and strains of traction uniformly and have a tendency to work loose—chafing then occurs and ultimately a blow-out.

Pinched inner tubes are usually caused from the tires being under pressure and not fitting snugly to the rims.

The adhesion of a tube to the case and deterioration of the rubber may be caused by a lack of lubrication, but as a usual thing may be traced to excessive heating from riding the tire soft.

Keep the Tires Inflated

Reinflate the tires occasionally as the inner tubes are slightly permeable. When the rubber is heated to 80 degrees or more, 15 to 20 per cent. of the pressure is lost. It is not advisable to inflate tires with the exhaust from the engine as oil and certain gases are destructive to the rubber—this does not have reference to pumps operated by power from the engine.

Air is the best for inflation. Occasionally deflate the tires and fill with a fresh supply of air.

There are several other matters that are closely related to the service the tire gives. Among these should be mentioned the proper care of cuts and bruises, and the protection of the tire surface from oil. It is important that the cuts be filled with a rubber composition as soon as they appear because if this is not done moisture and sand will get into them and destroy the fabric, the final result being a blowout. Of equal importance is the protection of the casing from oil. The car should not be allowed to stand on a greasy floor, because the oil will be taken up by the rubber and will in time rot it so that the tire will give away long before it should.—L. GREENWALD, chief of Service Department, Firestone Tire & Rubber Co.

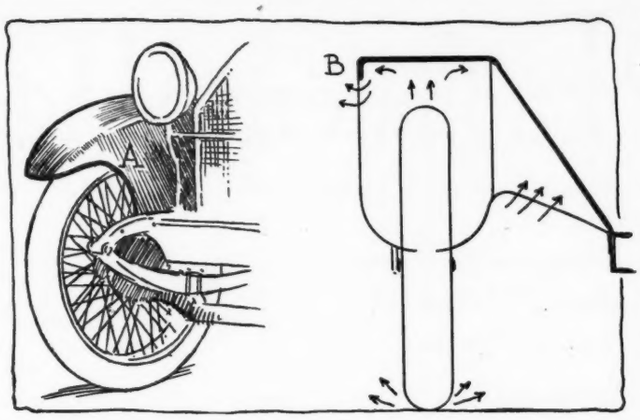


Fig. 1—Left—Modern front fender design. Note opening A, permitting passage of mud and water. Right—Water thrown on the outside of the fender follows arrows B, and falls on running board and body

Improved Protection Against Mud and Water in the Modern Car

FLINT, MICH.—Editor THE AUTOMOBILE:—When we stop to look at the car of today standing by the curb we cannot but admire its graceful appearance; we are pleased by the streamline body; we approve of the clean arrangement of the running boards, giving free access to the seats on both sides; if the top is folded, we notice how it is tucked inside a cover whose outside lines harmonize with the general design; we find with satisfaction that the extra tire is strongly fastened in the rear; the fenders swoop down gracefully both at front and rear, affording seemingly ideal protection against weather.

But take this beautiful car away from the clean streets of the city and drive it on a rainy day, or after a rainy day, through the country, when our not-too-good roads are still wet, and after ploughing through mud and water for a few hours, stop and look at it. The front of the radiator is covered with mud, the hood has taken its full share, too, for the front mud guards do not guard at all; the windshield has changed its name and is a water shield which does not shield; the sides are spotted with mud, and we are indeed lucky in the forward seats if we have escaped the waves which have stormed the front of the car. The rear has fared better but also shows traces of the storm.

Cars Built for Good Roads and Weather

All this tends to show that if we have increased the comfort of riding to a great extent during the last few years; if the designers have been busy building bodies with graceful lines and paying great attention to many details of refinement, we have built cars for good roads and clement weather only.

In the last 2 years a distinct improvement has been made in the rear fenders, which have been rounded down past the center of the wheel, thus protecting top and rear seats more fully—but nothing was done for the front fenders where it is most needed.

Front fenders are generally made to cover part of the front wheels and are connected to the frame side by an apron, which opens up curiously in front, leaving a clear way A, Fig. 1, for mud and water to splash through.

Consider what happens when we strike a pool of water. The splash sends the water to both sides, then the tire picks up a certain amount of water and the centrifugal force throws it against the inside of the fender, a new splash occurs whose strength is proportionate to the speed of the wheel and which divides the water into several rivulets which fly one on the right, one on the right and down following the curved shape of the fender; part of it is caught through the opening A, and is carried through its own speed and the car speed against the hood side and the dash board—and naturally, the greater the speed, the stronger the splash.

We have there an addition of two independent forces, the splashing of the water and the speed of the car. During the time elapsed between the moment the water appears at the opening and the moment it touches the side of the body the car has traveled a certain distance which explains that the muddy spots are not confined to the hood but appear all along the body.

We have seen what happens to the water flying inside; the part thrown on the outside follows arrows B, Fig. 1, and is carried outside the fender on the top of the running board and on the side of the body.

The radiator receives part of the horizontal splash, which is the initial one and is more pronounced than those just described, having the weight of the forward part of the car as its chief cause.

The Remedy—Improve Fender Design

Therefore, to cure these inconveniences, the remedy seems to be to extend the front fender down as far as possible, making a complete guard on the inside and covering the space between

(*Continued on page* 517)

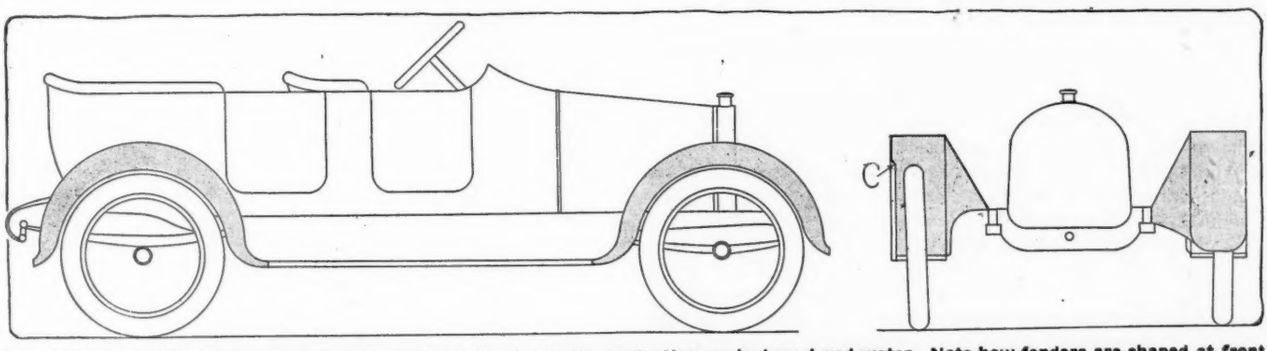


Fig. 2—Left—Fender design suggested by engineer to give better protection against mud and water. Note how fenders are shaped at front and rear. Right—Tipped-in edge at C for taking care of the outside splash and carrying the water to the ground

The Engineering Digest

Dr. Ormandy Gives Figures to Prove that Motor Fuels Cannot Be Expected from Coal in Sufficient Quantity

ALCOHOL MIXTURES THE ONLY HOPE

An argument of considerable force, directed against the current belief to the effect that an unlimited supply of "motor spirits" suitable for competition with gasoline may be obtained by distillation from coal, was delivered recently before the Royal Society of Arts by Dr. W. R. Ormandy, member of the Institute of Automobile Engineers. The gist of the reasoning was that in the distillation of coal all enterprise must necessarily be controlled by the demand for the most important and valuable product of such distillation, which is coke; in other words, if the distillation process by which 5 gallons of motor spirits is produced from 1 ¼ ton of coal leaves 1 ton of coke to be disposed of at a profit and this cannot be done if more coke is produced than the market demands, the process becomes commercially impossible on any scale which would meet the wants of the motor industry and establish an active competition with fuels derived from petroleum. The lecturer showed that it is probably impossible to stimulate the demand for coke to anything like the degree which would be required and that therefore the hopes of the motor industry should be turned in other directions, from which practically unlimited supplies may be derived. He considered that alcohol presented the best chances and that the need of the hour was practical experiments to ascertain what admixtures of alcohol may be used in existing motors; this as a stepping stone toward using mixtures in which alcohol is the predominating ingredient for motors modified by a natural development to make the use of such new fuels altogether desirable.

It was apparently taken for granted by Dr. Ormandy, though not in the same degree by his audience, that the possibilities for developing motors adapted for burning non-volatile fuels were either more remote or in other respects less worth cultivating than the possibilities for adapting alcohol mixtures to motors of the prevailing type, although he emphasized that "at present the production of alcohol is hedged about with such restrictions and the utilization of the finished product hemmed in with so many difficulties, that the inventor is inclined to regard the whole field as unworthy of serious work."

Some of the most telling arguments advanced related to the increase in the demand for motor fuels which has taken place since 1904 and which is continuing at a rate rendering it unlikely that any opening up of new oilfields will make it possible to keep pace with the demand.

In 1904 England used 5 million gallons of gasoline for motor cars and 20 million gallons was looked forward to as the maximum which would ever be demanded, but in 1912, 100 million gallons was used and in 1913, 20 million gallons more. The London omnibuses alone consume something like 15 million gallons annually and it is estimated that the London taxicabs use almost as much.

A professor at an American university has calculated that the annual demand for gasoline in the United States foots up a total of about 1,500 million gallons, out of which a large proportion is used for small industrial motors and for agricultural operations. Private inquiries, the results of which had been afterwards confirmed, placed the production of motor cars in the United States between 500,000 and 550,000 for 1913, and this addition to the number of consumers would alone call for an increase in the demand for gasoline amounting to 150 million gallons for one year. On the approved basis of 10 per cent. of gasoline from crude oil, an extra output of 5 million tons of crude oil was thus required to meet only the demand caused by one year's increase in the number of motor cars in America, and the American increase in other directions was probably also enormous.

Sir Boverton Redwood, who was in the chair at the meeting and took part in the discussion following the reading of the paper, added other startling figures taken from *The Times* of February 3. According to these, 440,000 motor cars of all kinds are now in use in Great Britain, and 1,700 are added to this total every week. They represent a purchase price of 55 million pounds sterling. Close on 20 million pounds was spent on new cars and motorcycles in 1913 and an additional sum of £5,773,396 on spare parts and accessories. Tires cost annually £14,521,000 and fuel and lubricating oil close on £8,500,000. It was estimated that before the present year was out the annual expenditure for motor cars and their operation would reach the sum of 100 million pounds sterling, out of which British labor obtained in wages £37,500,000 distributed among 375,000 persons, the wage earners for about 1 million of the population. In the face of these figures Sir Boverton considered it necessary to provide in time for the fuel supply of the future, and he, too, looked to alcohol as the most promising source, though he also expected good results from the successful efforts now being made to convert heavy hydrocarbons into more volatile products.

Dr. Hele-Shaw called attention to the fact that the price of benzol, which last summer was lower than that of gasoline had now risen higher than that of the best shell spirit.

Supply Available by Coal Distillation

In reveiwing the methods by which substitutes for petroleum products may be obtained from coal, Dr. Ormandy offered several interesting estimates. The gasworks constituted the oldest source of supply, but by no means the largest, he said. The present production of tar at the gasworks was about 1 million tons, from which little more than 1 million gallons of benzine or benzol could be produced. Enthusiastic but misguided people advocated to strip all the illuminating-gas of its volatile liquid constituents, but by this means only 20 million more gallons could be placed upon the market per annum [while the gas industry would become demoralized in various ways specified by the lecturer]. By-product recovery coke ovens, as operated on a large scale in Germany and Belgium, could give a much larger supply than the 1 million gallons legitimately available from gasworks, but even if all the coke utilized for metallurgical purposes were produced in this manner in England the maximum total addition to the stock of motor fuels would be only 30 million gallons per year, the price of which, moreover, would depend entirely upon the coke market, and the quantity of which would be very materially reduced if it were found practicable to sell the gas product of the recovery-ovens for heating and illumination purposes, instead of converting it, as is done on a rapidly increasing scale in Germany, where the sale of gas from this source has been doubled every year since 1908.

It was fantastic to suppose that industries of such magnitude could be influenced to follow new lines of production through the comparatively insignificant demand for cheaper motor fuels.

By modern low-temperature distillation processes it is known

that large yields of volatile products can be obtained, but these processes call for an enormous initial investment in plants, while the main product after all remains the coke and the gas, for which a profitable market must be found, though in lesser degree than in the other instances mentioned. At all events it could not be expected that the investments required in order to keep pace with the increasing demands of the motor industry would be made, at least not till after many years of painstaking experimentation.

Among new possibilities it is mentioned that Dr. D. T. Day, chief of the Geological Survey of the United States, according to a recent issue of *Petroleum Review* has announced to a meeting of the members of the Franklin Institute that a substitute for petroleum, having all the properties of a first-grade oil, has been manufactured by members of his staff and that the making of this petroleum substitute would have a great effect upon the oil markets of the world; also that the process involved is a secret one and is controlled by United States government officials. What aid may come from this source it is difficult to estimate, but Dr. Ormandy infers that the substitute in question is produced from materials stored in the soil, while it is preferable to place faith in a product which, like alcohol, can be taken from the soil every year in accordance with the demand and in almost any region of the earth.

The Probable Cost of Alcohol

It is in the lands of abundant sunshine where starch and sugar products can most readily be produced, and Dr. Ormandy states that officials in the tropical colonies of England vouch for a limitless production of 95 volume-per-cent. alcohol at a cost price equivalent to three pence per gallon (6 cents). This figure, however, does not include the cost of plant, fuel and wages; items which grow less in proportion as the output increases.—From *Journal of the Royal Society of Arts*, February 6.

Means for Preventing Sudden Extinction of Electric Headlights

As nowadays generators are perfect and storage batteries robust, the interruptions which can take place in the electric lighting service of an automobile are practically always due to lesions of the wire conduits or to faults in the design or mounting of the plant, according to the French specialist Léo Robida. The only dangerous thing which may happen is the suddent extinction of both headlights, and the precautions taken to avoid this contingency are usually sufficient. He enumerates the points in design which should be observed about as follows:

Safety fusion plugs should be placed in the circuit for each light, rather than making one plug do for both. The wires connecting generator, battery and distributer should be fully protected, preferably within metal tubes, and no opportunity should be given for the slow wearing of insulating material on the edge of a tube. In this respect no difficulties exist, however. The wiring from the distributer to the headlights and other lamps is more liable to become deranged. The first precaution at this point is therefore to make the wiring for each headlight completely independent of that for the other. They should have neither plugs nor wires in common. Then, if a wire is broken or a plug melted, only one light is put out, and the other obviates accident. Above all, the two lights must not be placed in series on the same circuit, as has been done by one American firm; for, in that case, the inevitable eventual rupture of the filament in one lamp causes the extinction of the other lamp as well—which is the one thing to be avoided at all events.

These matters observed, the two lights cannot go out at once, unless either the voltage fails or it is suddenly increased sufficiently to burn out both filaments. These two dangers can arise only as the result of an accident to the source of the current and are to be obviated through proper design and workmanship of these elements—the battery and the generator.

The battery is subject to two failings: Short-circuiting and breaking of connections.

The short-circuiting of a cell, as may result from the dropping of active material from the plates, only produces the lowering of voltage and a slight dimming of the lights. A complete short-circuiting of the whole battery can be avoided by suitable insulation; if one of its poles is grounded, by design, the other pole must be carefully insulated. In that case, a short-circuiting due to an interior cause, such as leakage of electrolyte or the breakage of a cell, will never become pronounced. The immediate consequence will be only a slight drop in voltage, and subsequently there will be a slow exhaustion of the battery, by which the trouble will be disclosed if it escaped attention in the first place.

In view of the possibilities for short-circuiting it is advisable not to arrange a battery in such manner that the first cell is adjacent to the last one. Also the wires should not be left long and flexible but should be so short and rigid as to keep their places with relation to one another.

The only other chance for a short-circuit is that some metallic piece might accidentally be placed upon the top of the battery connecting terminals.

The breaking of connections is more difficult to forestall than short-circuiting. The acid eats by degrees into the lugs of battery plates and climbs into the insulation of the wires, sometimes eventually cutting a connection. This danger can be reduced by good insulation and careful details, and the expedients adopted vary according to the type of generator used.

Generators are either of the constant-voltage or the forced-current type. Their power can be notably inferior to that demanded for the lighting or it can be larger. Which of these types is preferable?

The forced-current generator was the type first developed. It must be constantly connected with the battery. Suppose its capacity is 8 amperes and that the lamps consume 9. Normally the battery will then deliver 1 ampere to make up the need. If the breaking of a connection occurs, there will not be enough current delivered. The lamps will be dimmer but they will not go out. Suppose, on the other hand, that the generator develops 12 to 15 amperes. In this case the battery absorbs the excess of current above 9 amperes and is recharged while working. If a battery connection is now broken, the surplus current goes to the lamps, burns the filaments and leaves us suddenly in the dark. With this type of generator the best plan is therefore to have lamps which will consume nearly all that the generator will deliver. This rule should be followed more or less absolutely according to the arrangement of the generator. Each make of generator of the forced-current type obeys in fact its own law with regard to the increase of voltage which takes place when the current is reduced. In some of them a large reduction raises the voltage only slightly, and these are preferable because they can be more powerful than the lamp requirements seem to demand, without danger, and will recharge the battery better than smaller ones. If a connection is broken and the draft on the voltage from the battery is removed, the voltage jumps and the current consequently diminishes. If a reduction of current takes place as large as referred to above, from 15 to 9 amperes, the voltage will be raised very little and will not overstrain the lamp filaments unless they are pushed to maximum capacity beforehand. Their light will shine more brightly, and this will serve as a warning to inspect the installation, but they will not burn out at once.

The other type of generator gives by design and definition a constant voltage, and consequently the voltage is not raised sensibly by interruption of the battery connection. Its regulator counteracts this effect, and lately some builders of generators of the previously mentioned type have added voltage-limiting devices to get the benefit of the same security.

Only disorder of the regulator can with these provisions make the voltage jump, and in practice the battery would have to be out of order, too, to make the increase of voltage strong enough

to damage the lamps, the battery otherwise protecting them for a while. But the notice given through increased brightness of the light should be heeded in time, before the battery becomes completely charged.

So far as disorders of the generators are concerned, they will stop the supply of current and will leave the lighting to the battery alone. The only possible danger is that the generator may discharge the battery by short-circuiting it, and a good electromagnetic interrupter can forestall the return of current from battery to generator. A fusion plug between the generator and the battery can do the same, and the melting of it will not suddenly affect the lighting. Maintained by the battery alone, the light will gradually become weaker if the battery is only lightly charged, but evidently all chance for accident is excluded.

Summarizing, it is seen that, in the case of a well designed installation, the breaking of a wire, a disabled regulator, a short-circuited generator, etc., cannot result in the sudden extinction of the headlights. Two independent disorders due to independent causes are necessary to bring about this effect and, as any actual coincidence in time of really unrelated events is exceedingly unlikely, the situation offers all the guarantees that could be demanded, so far as the personal security of motorists in depending upon their electric light equipment is concerned.—From *Omnia*, February 7.

Wheelbase Area Proposed as Legal Criterion for Cyclecars

VITALLY interested in a definition! This attitude, unusual in trade or industrial circles, is manifested with regard to the cyclecar. In Europe the interest may be explained as the upshot of the taxation of automobiles, which in the different countries is determined more or less by definitions, formulas, horsepower and sizes. A traditional dread of paying more taxes than absolutely necessary, whether economy is practiced in other directions or not, is to a great extent responsible for the little 10-tax-horsepower cars of Germany, for the miniature cars of France and for the cyclecar movement which has now spread from Great Britain to America and France, and it is also blamed for the adoption of very "nervous," high-speed (3,000-revolutions per minute) motors for these small cars, because it is by this style of motor that it is possible to obtain a power three times higher than that to which the motor figures out by the tax-horsepower formulas. It is now hoped that a definition for the cyclecar, if one can be agreed upon, will result in a taxation class still lower than that in which the small and ostensibly low-powered ordinary cars or *voiturettes* are listed. On this basis Mr. Damien proposes that cyclecars be defined, so far as France is concerned, by their wheelbase area, maintaining that this definition is suitable, since smallness is really the only feature cyclecars have in common, is also perfectly clear for all legal purposes and leaves a highly desirable latitude for constructors. The only additional feature included in the proposed definition is that the cyclecar shall have only two seats, at most.

By wheelbase area is understood the length of the wheelbase multiplied by the wheel gauge, both in centimeters, giving the result in square centimeters. In the case of three-wheelers, it is further proposed, the area arrived at by this figuring should be divided by 2, since the area of a triangle—the actual base for this style of vehicle—is one-half that of a rectangle of same width and height; and the broader gauge and longer base generally considered necessary for three-wheelers would in this manner be taken into account. The proponent leaves the exact figures for the wheelbase area to be decided by those most directly interested.

Among the reasons for choosing wheelbase area as a criterion there is mentioned the fitness in having tax decided by the amount of space occupied in the traffic and the shortcomings of all other definitions which have been proposed. Cylinder volume is unsuitable because in point of fact some indisputable cyclecars have a larger cylinder volume than certain other vehicles whose classification as normal automobiles cannot be denied. The price cannot be accepted as decisive, as this would lead to equivocations of many sorts. To limit the weight would be to encourage frail construction and claptrap expedients for bringing the weight within the limits if it was exceeded by the original construction. No builder, it is argued, can know in advance exactly what will be the weight of a vehicle, nor what will be the cost of production by which the price must be regulated. And he cannot be expected to proceed without knowing whether his product, under the governing definitions, will be classified as an automobile or a cyclecar.—From *Omnia*, Feb. 7.

[The definition suggested in America of a cyclecar as a "four-wheeled vehicle made from motorcycle parts" is not mentioned and, in fact, could not be considered for purposes of taxation or any other purpose for which a definition may be desirable, as it is not a definition at all but a loosely descriptive appeal to the imagination, it being conceded that no four-wheeled vehicle can be built entirely from motorcycle parts. If it is desired, however, to secure a lower registration fee for cyclecars than for automobiles in general, a legal definition may be required, here as in Europe, and the liberal one proposed by Damien seems to have practical advantages entitling it to attention, while it need not be forgotten that it would establish only an arbitrary criterion but would supply no idea of what a cyclecar is or should be—no more than the criterion of the bear family, defining these animals as plantigrade mammals with a certain formation of the teeth, can give any advance idea of either a grizzly bear or a raccoon. Damien's proposed definition, it may be noticed, annexes motor tricycles to the cyclecar class, through the fact that motor tricycles have a wheelbase area.—ED.]

Hungarians to Attempt Contest for Automatic Motor Starters

RELIABILITY tours through the Carpathian mountains are among the events regularly organized by the Royal Hungarian Automobile Club. In connection with this event for 1914 it has been decided to hold a contest for automatic motor starters, and the rules for this special feature are now being worked out through consultation with all the manufacturers who are interested. The club submits some fundamental rules about as follows:

Competing devices must be of regular manufacture and as specified in catalogs; they must be mounted upon cars entered for the Carpathian Tour. Only those devices which successfully accomplish all the motor-starting required during the tour will be admitted to the subsequent special starter tests. During the entire competition no work at all must be done upon the starting-device; that is, every minute of such work will be penalized.

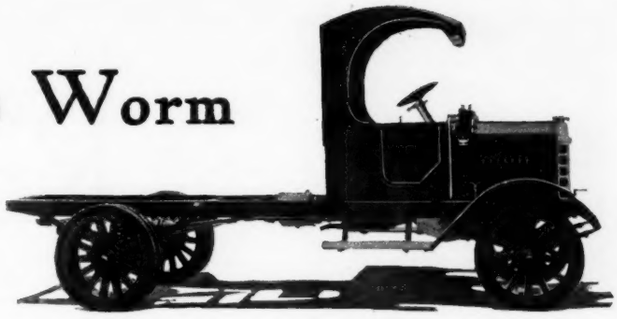
Devices passing through the tour unpenalized are awarded the club plaque and become qualified to compete for the 3 prizes. In this competition the devices will be judged according to (1) price, (2) weight, (3) volume, (4) available working-capacity, (5) facility for mounting in standard cars and (6) cost of upkeep.

An example illustrates the plan for according the points: If the cheapest device costs 600 Kronen, the most expensive, 2,000 Kronen and 20 devices are competing, the first device gets point 1, the second point 20 and all the intermediate devices get points determined from their price in each case by interpolation between 1 and 20. One costing 1,000 Kronen thus gets 4.71. The same system is applied to the other features. If it is decided to judge the different features on a basis of different relative values, the points for each feature will be multiplied by corresponding co-efficients.

A number of additional questions of more technical interest are still under consideration; among these how to judge devices used for lighting as well as for starting.—From *Automobil-Rundschau*, February 1.

New Sternberg Uses Worm

Straight-Line Drive a Feature



THE 2.5-ton truck recently brought out by the Sternberg Mfg. Co., Milwaukee, Wis., has a number of distinctive features, the most prominent of which is the adoption of an overhead worm drive shown in the accompanying illustrations. In designing this truck, the makers have aimed at simplicity, accessibility, comfort for the driver, low upkeep cost and silent operation. An interesting point in connection with the worm drive is the straight-line drive which is obtained by mounting the three-speed selective gearbox on a subframe and using four universal joints to take up distortion due to frame movements.

The truck is designed for an operative speed of 14.5 miles an hour and is suitable for use in express, furniture moving, delivery or other work. In accordance with Sternberg construction it has a pressed steel frame with a standard length overall of 218 inches, and an overhang of 46.5 inches beyond the rear axle. Wheelbase is optional. The standard loading platform is 10 feet 6 inches long and 6 feet wide. The frame is 33.5 inches from the ground when the truck is fully loaded. Front tires are solid, 36 by 4 single and rear 38 by 4 dual. Left drive and center control are used.

The motor used is a long-stroke type, 3.75 by 5.75 inches, operating at 950 revolutions per minute, with a chrome nickel steel crankshaft and a patented non-hunting and self-lubricating governor.

Cylinders, pistons and rings are of semi-steel mixture of very close grain. They are tested five times during manufacture for imperfections. The pistons have two rings of special design, are relieved in the center, and have three oil grooves on the skirts. The piston pins are of chrome nickel steel.

The connecting-rods are drop-forged, 40 point carbon steel, heat-treated, having a split clamp upper end, and four-bolt crank pins lower end.

The crankcase is of aluminum alloy, very heavy, and ribbed in the highly stressed sections.

The timing gears are helical.

The lubricating system is of a special splash and forced feed type and consists of a geared oil pump and one oil pipe.

The governor is of the flyball type, so designed that the spring which sets the speed also binds all the moving parts together, and insures simultaneous action of all parts. With the dashpot this construction eliminates hunting. The wear of the governor parts tends to slow up the motor. The speed of the governor can be easily adjusted, and the governor sealed so as not to be accessible to the driver. It is entirely inclosed and all wearing parts are lubricated by the oiling system of the motor. The governor can be used both as a maximum speed governor and for handling a load.

The Hele-Shaw multiple disk clutch is bolted to the flywheel and is a unit with the motor, being entirely housed by an accessible aluminum casing.

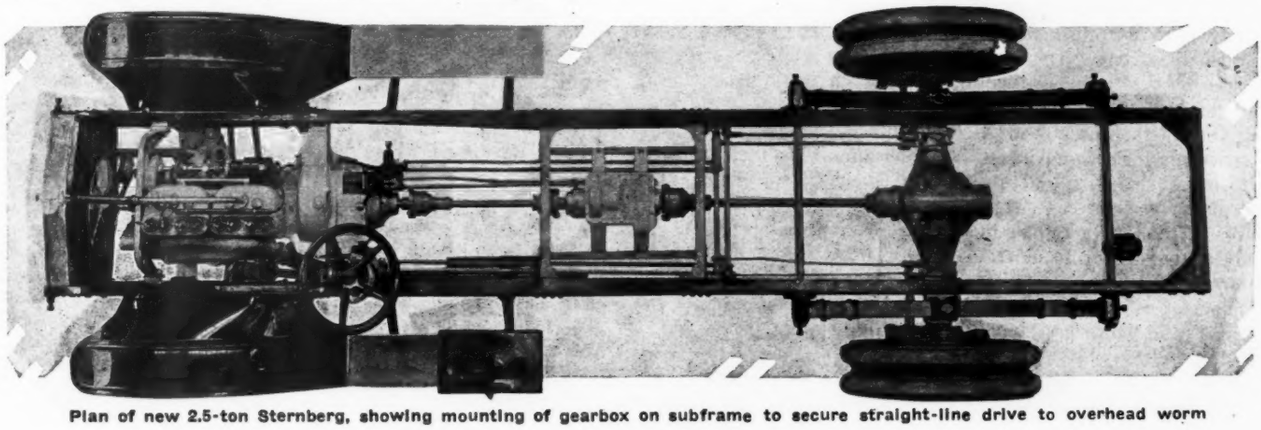
The Holly carbureter is used, equipped with a temperature regulator. This regulator supplies hot or cold air to the carbureter as required, the necessary adjustment being made by a dial located on the dash.

The rear drive is through a worm and wheel and is a straight line under load. The worm and wheel differential gears and bearings are mounted on the rear axle cover. This unit can be removed by withdrawing the axle shafts and taking out the bolts passing through the cover and the axle housing.

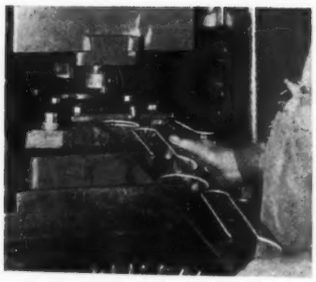
The service and emergency brakes are located at the rear wheels. Both internal and external are of toggle joint construction. The brake drums are 16 inches in diameter while the bands are 3 inches wide.

The cab is standard equipment and is furnished with foredoor for the comfort of the driver. The price is $3,250.

Rear construction, showing mounting of overhead worm and of springs



Plan of new 2.5-ton Sternberg, showing mounting of gearbox on subframe to secure straight-line drive to overhead worm



The Rostrum

Defends Equipment on Ford Car

EDITOR THE AUTOMOBILE:—*It has been 7 years since we first subscribed for your paper and we think so much of it that we would not be without it, and have never felt impressed to "come back" at either editor or correspondents till within the last few weeks.*

G. W. R., in the Rostrum of February 15 criticises Henry Ford for not putting more into his car than he does, instead of cutting melons with his employees, stating, "That the Ford car as marketed is regarded to be short of essentials and refinements is shown in the almost limitless parts and accessories made in all parts of the United States and exploited as indispensable to the convenience and comfort of Ford car owners, and that they are so regarded by possessors of Ford cars is proven by the sale of these 'accessories' from sight oil glass to electric starter."

As a motor owner of 10 years' standing and a close student of cars and especially Fords for about 5 years, I would like to say in reply to above that the statement that the Ford is short of essentials is disproven by the fact that thousands of Fords are run without a thing added to them, by people in all walks of life.

The multiplicity of accessories offered is the result of the immense number of Fords in use, consequently many possible customers, also the buyer gets his car cheaper than his neighbor who buys other makes and feels that he can afford a few of what I call frills and furbelows.

The Ford appeals to the wants of the great crowd of folks who want a solid little car for service and to others who want to frill it to suit themselves, and the fact that they are sold below the price of other cars is evidence to me that a man comes nearer getting his money's worth here than elsewhere. If he does not think so why does he not get some other make of automobile?

As to Professor Taylor's letter criticising the class of people benefited by Ford benefactions we might be pardoned for crying sour grapes, for we remember that another financier in giving his money away included the Professor's class, with no objections raised. As a man who has been in the working class as a mechanic and is not far out of it yet, will say that no member of that great number has been seen in print or heard condemning this move of Henry Ford.

With reference to the editorial criticisms on account of "industrial disturbance" it would seem that it was a bit hasty, for no movement of the same magnitude has been made with less disturbance and the plan or something akin to it has been, and is being, followed by other firms with undoubted benefit to, ultimately, the whole people.

Van Alstyne, Texas. D. P. YODER.

Criticizes State Automobile Bureau

Editor THE AUTOMOBILE:—I think it is only a matter of public interest that it should be known that the Office of the Secretary of State, Automobile Bureau, Broadway and 74th St., New York City, does not follow the shipping directions as to sending plates when they have been paid for; and having made an error, refuse to correct the same by forwarding the plates from the incorrect point of delivery to the correct one.

On my application for plates I distinctly advised them in the space left for such advices on the application form that they were to be shipped to Floral Park, Long Island. I signed my letter from 60 Wall Street. They delivered the plates, however, to 60 Wall Street. On calling them up about it they refused to get them and deliver them as they were instructed to do on their own application. This forces the owner of the car to make reshipment of them to the country, and causes inconvenience and expense to which he should not be subjected.

I write you this letter and am sending a copy to the Office of the Secretary of State, Automobile Bureau, Broadway and 74th St., New York City with a view of ascertaining whether or not the methods of this office cannot be reformed. Having made such mistake, the least they could do in all fairness to the public would be to correct same promptly and cheerfully.

As a subscriber to your paper I would thank you to publish this in your columns.

New York City. WILLIAM A. LAMSON.

Complains About High Cost of Cars

Editor THE AUTOMOBILE:—Since the day has arrived when one automobile manufacturer, at least, has admitted clearing from $20,000,000 to $25,000,000 dollars in one year, I think it is time for the automobile owners, who have made all this possible. to pause and consider what they get for their money.

Since 1902 I have been the owner of five automobiles, for which I paid $5,175, and on which the repairs and depreciation alone have amounted to $4,000. My repairs have cost me very little in comparison to some owners, as I have had only minor accidents, and most of my repair work has been done by my own help.

Expensive service stations, with marble floors, hardwood fit-

tings and furniture, and agents' commissions all increase the cost of the car to the man who pays the freight.

Pure petrolatum, such as is sold in drug stores for medicinal purposes, costs 4 or 5 cents a pound in large quantities, but the cruder form, when put in a can with a fancy label, is sold to the motorist for 20 to 25 cents a pound. So with tires, oils, insurance, etc. All could be purchased at more reasonable rates if all motorists were banded together in an association which would look after their interests.

Evidently there is too much profit and too little real value in most cars or they would not depreciate as rapidly as they do at present.

The only axe I have to grind is to secure in common with other motor users, more service and satisfaction for my money; so I hope you will publish this letter and see what can be done to improve the situation.

Camden, N. J. R. I. HAINES, M. D.

Making Piston Rings From Flat Plates

Editor THE AUTOMOBILE:—The first time I was asked to make new piston rings I was caught unawares. I had no cylindrical stock out of which rings could be made but on rumaging around I found a thick, flat, cast-iron plate of about the proportions shown in Fig. 1. This had once been used for a bed plate and which I sawed in two along the center line AB. Any machinist will understand how I cut the rings out on an ordinary lathe, Fig. 2. The operation is simple. I had to work in such cramped quarters on account of the narrowness of the plate that I couldn't do accurate work with ease. The plate was only thick enough to make two rings from each disk cut out.

Then I rigged up a wooden mandrel just large enough so that the rings could be driven on. I gave the rings proper eccentricity by cutting off both ends of the mandrel as indicated and nailing them back on a few hundredths of an inch off center.

I then easily finished the rings accurately on this improvised mandrel, running the mandrel at the highest speed possible with my lathe.

New York City. W. F. S.

The Advantages of the L-Head Block Motor

Editor THE AUTOMOBILE:—1—Will you please give the advantages of the mono-block, L-head motor?

2—Does the overhead valve motor tend to save gasoline, other things being equal?

Brunswick, Me. HENRY C. HASKELL.

—1—The advantages of the block, L-head motor can best be explained by taking up the block and L-head types separately and pointing out the advantages of each.

The main points in favor of an L-head motor are that the cylinder casting can be made somewhat lighter and smaller, only one camshaft is required and radiating surface is reduced, thus giving increased economy.

The block motor is mainly used because it is cheaper to manufacture. Only one set up is required in boring the cylinders, for instance, but where the cylinders are cast in pairs or singly, each unit has to be set up separately. Piping is simplified thus not only reducing manufacturing cost, but also eliminating piping troubles due to leaky joints and the like. The block motor is also shorter and more rigid.

2—The motor with overhead valves should be slightly more economical than the other types for the reason that the radiating surface is somewhat less and therefore there should be less heat lost to the water jackets.

Suggests First-Aid Package for Tourists

Editor THE AUTOMOBILE:—I would like to suggest something which seems not to have been touched upon in the automobile press, viz: the carrying of a small package of surgical appliances as a part of the touring kit of the car. The habit is common among those who go into camp and would seem to have much more reason in the case of automobile parties, whether on their own account or for the benefit of others who meet with accidents on the road. The list mentioned below is of no more weight and occupies no more space than a single inner tube. It is not necessary that any one in the car should be skilled in its use; there is much more probability of a doctor being conveniently available than the supplies to be mentioned, viz: a small hand bag containing as follows:

½ pound of absorbent cotton
5-yard roll of 1½-inch surgeon's adhesive plaster
Two 2½-inch and two 3½-inch gauze roller bandages
A triangular bandage, a small bottle of bichloride of mercury tablets.
4 ounces of grain alcohol
A Parks artery forceps, surgeons' silk, needles and vaseline
Two pairs of splints.

I trust that the above list will prove of sufficient interest to be criticised and improved upon by those better qualified to speak than myself.

New York City. CHARLES E. MANNIERRE.

Friction Transmission for Large Cars

Editor THE AUTOMOBILE:—Would you recommend friction drive for a seven-passenger machine with the motor rated at 48 horsepower according to the S. A. E. formula?

Lakewood, O. CARL SCHUSTER.

—A friction transmission for a motor of this size could be built and would work satisfactorily but it is not to be recommended because of the amount of space it would take up, since a wheel and disk of approximately 32 inches in diameter would be required. If such a design were used a special body would be needed to give the necessary room and besides with an ordinary chassis the clearance between the disk and the ground would be somewhere between 2 and 4 inches. Of course, this could be increased by mounting the motor and transmission higher in the frame but this would also be objectionable.

All the conditions governing the proportioning of the various parts of the friction transmission are more or less fixed except the wheel and disk diameters. Assuming an allowable working pressure between the disk and wheel of 250 pounds per inch of width of the wheel face, the horsepower that this type of drive will transmit is expressed by the formula

$$\text{h.p.} = .00055\ DWN$$

Where D = the mean diameter of the driving wheel in inches
W = the total effective width of the fibre friction face
N = revolutions per minute of the disk.

It has been found that it is not good practice to make W larger than 1/12 D, for the reason that a greater value will pro-

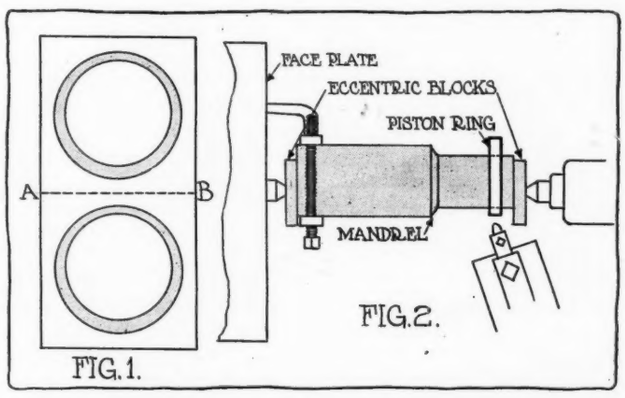


Fig. 1—Flat plate used for making piston rings. Fig. 2—Method of using wooden mandrel for turning outside of ring. The eccentricity is obtained by moving the end pieces of the mandrel off center

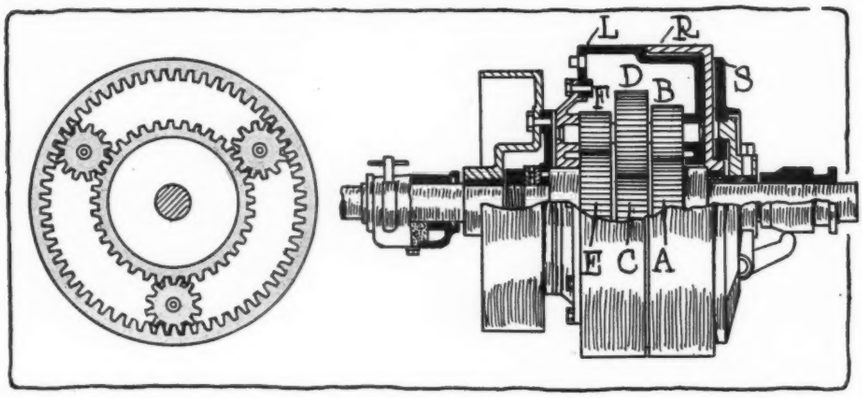


Fig. 3—Left—Diagram illustrating principle of planetary transmission. This is the internal gear type. Right—Part section of a planetary transmission with external gears throughout. The engine shaft is keyed to the shaft at the right, while the left one transmits the power to the rear. The low-speed drum is indicated by L, the reverse drum by R, and direct drive on high gear is obtained by forcing the disk S against the drum R. This locks these two members together and the result is that the whole case revolves as a unit

duce too much slippage between the inner edge of the wheel and the disk, especially when the wheel is traveling near the center of the disk. To be on the safe side it is well to assume that a motor rated at 48 horsepower S. A. E. is capable of delivering at least 70 horsepower at 1500 revolutions per minute, then substituting these quantities in the above formula, we have the following expression:

$$70 = .00055 \times D \times W \times 1500$$

Simplifying this equation, we find that:

$$D \times W = 85$$

Letting $W = 1/12\ D$, and substituting, we have:

$$\frac{D^2}{12} = 85, \text{ or } D = 32.$$

Thus it is seen that, while this type of transmission is all right for smaller cars, it would be too awkward for a car of this size.

Valve Timing on 30 Horsepower Buick

Editor THE AUTOMOBILE:—Will you explain how to time the valves on a Buick model 30 motor correctly from markings on the flywheel?

Mechanicsburg, O. E. R. STOCKWELL.

—An inspection of the flywheel on the Buick 30 will show three markings quite near together. The first of these at the left indicates dead center. Two and three-thirty seconds of an inch to the right of this, is the line showing exhaust closing and 1 5-8 inches beyond this mark is the intake opening line. As the Buick 30 only has one camshaft the valves can be timed from either of these valve markings. For instance, bring the line denoting the intake opening to the center line of the motor and then mesh the gear on the camshaft so that one of the intake valves is just ready to open.

Fitting Center Control to Old E. M. F.

Editor THE AUTOMOBILE:—I take the liberty of writing you for advice which I find it difficult to secure from interested parties. I have a 1910 E. M. F. which I wish to use several years. The Studebaker company advises me to trade it in for a new car and not try to fix it up. Certain dealers handling bodies tell me it is not a difficult matter to fit this body to the 1910 E. M. F., but this does not convince me. I therefore shall state my case to you and ask for your advice.

My 1910 E. M. F. has run 12,000 miles in 4 years. The engine has never given me a moment's trouble. The car is in excellent condition with the exception of the body which looks shabby and is not a fore-door body. The fenders are in bad shape and have given me considerable trouble as they are not attached to the body. Now, I want to put on a fore-door, up-to-date body. I would like to put the control lever and brake lever in center of space in front of front seat. The Studebaker parts now used will not fit and cannot be used on 1910 cars, they write me. Will the Overland shifting gear outfit work on my car? Will it be a difficult matter to make the necessary parts for making my car center control, or can it be done easily and be a satisfactory job? If I can make the car center control, I can doubtless get a body to fit the car at a cost of about $125, which is $100 less than I must pay the Studebaker company for a 1911 body which has fore-doors but was made to fit around the control or gearshift lever on side of car and is not a first class, up-to-date body. The 1910 E. M. F. frame is only 30 inches wide and this makes it hard to find a body narrow enough and yet long enough for the frame. I shall very much appreciate your advice in this matter, especially regarding the changing to center control.

Stillwater, Minn. W. H. HOLLANDS.

—We believe that the Studebaker company is right. It would be better for you to trade in your present car for a new one, than to attempt to remodel it into an up-to-date car. It would be quite expensive to install the center control and a new body for this car would cost at least $250, so therefore we would say that if you want an up-to-date looking machine, it is better to get a new one.

The Overland gearshift could not be installed on your car without a great deal of special fitting and if you must have center control it would be much better to make a new gearshifting mechanism complete rather than to adapt that used on some other machine. In making a new gearshift you will need a supporting housing for the shifting lever and the lower end of this lever should be designed to fit directly into jaws on the ends of the shifting rods. This construction seems simple, but would cost quite a bit to make if a well working mechanism is desired.

Explanation of the Planetary Transmission

Editor THE AUTOMOBILE:—I wish you would explain by sketch and description the working of a planetary transmission.

Brooklyn, N. Y. H. A. GRANT.

—There are several forms of planetary gearing, and although they are the same in principle, they differ somewhat in details of design. This type of change speed gear has been most commonly designed for two-speed forward and reverse reduction, although a few three-speed transmissions have been made. Two forms of planetary transmission are illustrated in Fig. 3. At the left is a simple outline of the internal gear type, while at the right is a complete transmission of the spur gear type no internal gears being used in its construction. This latter type is the design which has been most commonly used.

The operation of the internal type planetary transmission illustrated at the left will be described first as a better idea of the principles of operation can be explained from this construction. In this transmission gear the central gear is keyed to the crankshaft and the three pinions are mounted on a housing that connects with the drive shaft or sprocket.

Slow speed is obtained as follows:—The internal gear is held from rotating by the contraction of a brake band on its surface with the result that the rotation of the central gear forces the pinions to travel around the inner periphery of the internal gear, and as these pinions are attached to the housing, that is connected with the rear drive, their movement rotates the housing and transmits the power to the rear axle.

Reverse is obtained by holding the pinions from rotating and allowing the drive to be transmitted through the internal gear. The rotation of the central gear in one direction turns the pinions and drives the internal gear in the opposite direction, thus giving reverse.

Direct drive is obtained by locking the housing carrying the pinions and the central gear together; this can be done by means of a cone or disk clutch.

Now turning to the other type of transmission which is illustrated at the right in Fig. 2, it will be seen that this is quite similar in principle, except that for the internal gear external ones are substituted. The shaft at the right is keyed to the crankshaft and drives gear C. Gear A is a running fit on this shaft while gear E is keyed to the shaft at the left from which the drive to the rear is taken. Gears F, D and B are keyed to the one shaft so that they rotate together at all times.

There are generally three sets of gears like F, D, B, for the sake of added strength and wearing qualities.

Low speed is obtained by holding the housing L by contracting a suitable band on its surface. When this housing is held stationary, the drive on low gear is through gear C to D, from thence to F, and back to E where it goes to the rear.

Reverse speed is obtained by constricting a band on the drum R. This drum is positively attached to the gear A so that when the drum is held fast the gear A must remain stationary. Thus, on reverse speed the whole housing L and the gear attached to it rotate about this gear A. This action is exactly similar to that in the transmission at the right, the gear A taking the place of the internal gear. The path of the power through these gears for reverse is as follows:—From the engine shaft the power is transmitted through gear C and from thence to gear D. The rotation of this gear turns the gears F and B because they are solidly connected with it. With the rotation of these three gears, gear B is forced to travel over A, which is stationary, and thus it rotates the drum L. From gear D the power is transmitted through gears F and E to the rear.

For high gear the clutch S is forced up against the drum R so that these two members rotate together, and this, as will be explained, causes the transmission to rotate as a unit. As gear A is fastened to the drum R it must also rotate with it and the clutch S. Thus the gears F, D and B are locked in position and cannot rotate. Therefore gear C cannot rotate, and when the power is transmitted from the engine shaft to gear C the whole housing must turn and transmit power to the rear. In this way direct drive is obtained on high gear.

Lights Go Out When Starter Is Operated

Editor THE AUTOMOBILE:—I have an Overland 1914 model equipped with a Gray & Davis electric starter and lights. When all the lights are turned on and the starter is then used all the lights go out while the starter is in use, but come on all right when starter is not used. Can you tell me what the trouble may be?

Ghent, N. Y. F. A. G.

—Your trouble is probably due to a short circuit in some of the wiring caused by worn insulation, so that when the starting switch is closed the lights are short-circuited. An inspection of the wiring will show whether this is the cause.

It is barely possible that some of the connections are incorrect and so it would be well to go over the wiring to see before the wires run to the right binding posts. A diagram of the Gray & Davis starting and lighting system as used on the 1914 Overland appeared in the Rostrum of February 12, and by studying this diagram the way the wires should be connected for proper operation of the system can be found out.

Charging Battery from 220-Volt Line

Editor THE AUTOMOBILE:—In the January 29 issue of THE AUTOMOBILE, a subscriber from Newark wants to know how he can charge his storage battery from a 110-volt D. C. line. I have used a board wired for a 220-volt line, Fig. 4, for 5 years with good results. Standard carbon lamps should be used, and the ampere charging rate can be controlled by the candle power and the number of lamps used, as follows, (approximately):

1—32 candle-power lamp at 220 volts = a charging rate of 1-2 per hour ampere.

1—32 candle-power lamp at 110 volts = a charging rate of 1 per hour ampere.

1—16 candle-power lamp at 220 volts = a charging rate of 1-4 per hour ampere.

1—16 candle-power lamp at 110 volts = a charging rate of 1-2 per hour ampere.

High voltage is not injurious to the battery if charging rate is properly controlled and a battery of any voltage may be charged from it.

Brooklyn, N. Y. H. P. WEEKS.

Motor Makes Grinding Noise

Editor THE AUTOMOBILE:—We have a 1910 model Cadillac in our shop that melted out a crankshaft bearing on number one cylinder. After doing so it broke loose and tore a hole through the crankcase and also took off the bottom part of the cylinder.

We sent the parts to a welding shop and had them repaired. The work was all right with the exception of the cylinder which had to be lapped in by hand, after which process it appeared to be all right.

The engine was then put together by men who understood their work, but on starting the car it at once developed a roar which sounded very much like gears meshing too deeply, but we cannot see how this could be the case. The roar or grind can be heard very distinctly at low throttle with each revolution of the motor, and is very pronounced at high engine speed, but when the motor is spun around by hand no noise is made. The car was tried out and developed considerable power, in fact, more than it had previous to being overhauled. Could it be possible that the piston is too light in the cylinder and causes this noise?

There is nothing that we can find that heats up in the least. The motor seems to be all right in every way but the noise. Will it hurt to run the car under these conditions? We have tried every way to locate this noise with a physician's stethoscope, but have been unable to do so.

Bosworth, Mo. H. W. M.

—The most common cause of a grinding sound in a motor is gears meshed too tightly. A possible explanation of your trouble is that in mending the crankcase the heat distorted it so that the camshaft is now somewhat nearer to the crankshaft than it was formerly with the result that the gears on these two shafts are in too close contact. This trouble may be remedied by changing the position of the forward camshaft bearing slightly or it may be sufficient to remove a small amount of material from the gears, although this is hardly to be advised.

It is also possible that the noise is caused by a loose camshaft or magneto driving gear. If this were so, however, the noise would be more like a rattle than a grind.

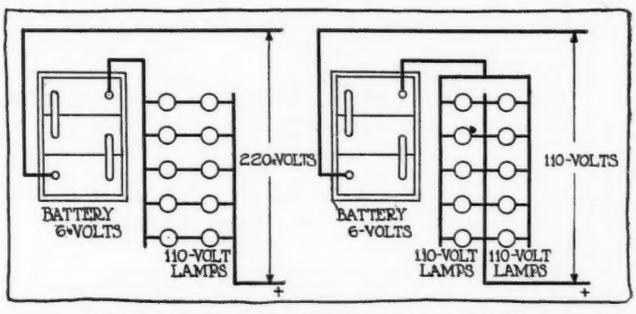
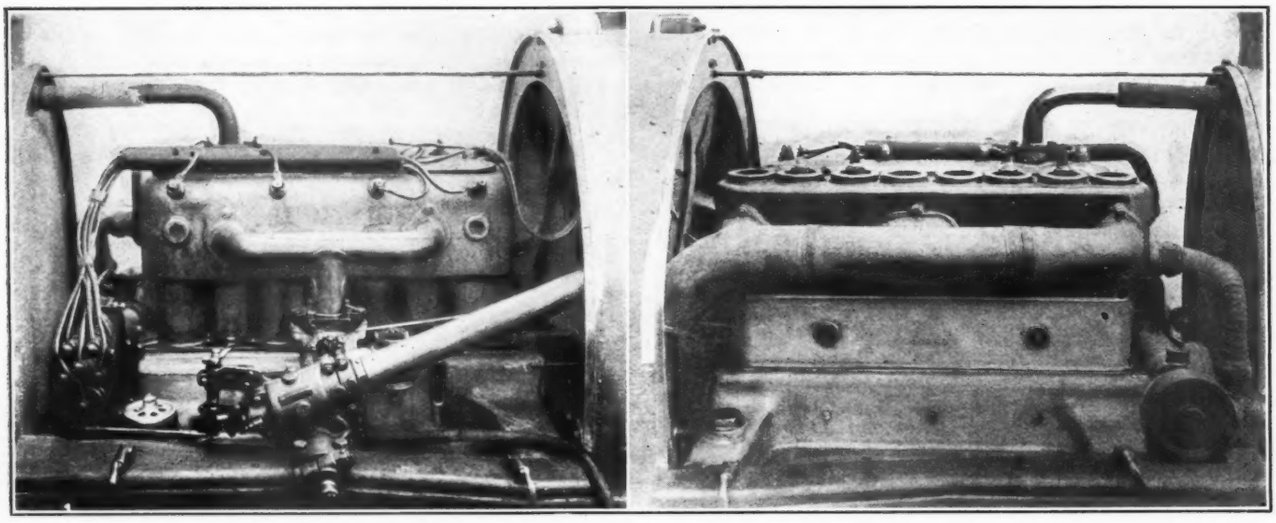


Fig. 4—Wiring diagrams for charging storage batteries from 110 and 220-volt Circuits



Figs. 1 and 2—Side views of Deltal motor, showing clean design, accessibility, and how the intake manifold crosses to the valves through the waterjacket

Deltal—A High-Speed Poppet Type

High Speeds, High Efficiency and Accessibility Aims of the Designer—Motor Is Rated at 25.4 Horsepower—300 Cubic Inches Piston Displacement—Uniform Cooling of Valve Seats by Waterjacketing

WE are enabled this week to reproduce two sectional drawings, Figs. 3 and 4, and illustrations of both sides, Figs. 1 and 2, of the Deltal motor, which made such a commendable showing in the 300-mile Elgin races last August, and which is of interest today in that it is representative of the high speed, high efficiency, poppet-valve types. E. H. Delling, 350 Ocean avenue, Brooklyn, N. Y., the designer and maker, has aimed at high speeds, high efficiency and accessibility throughout. The engine is a four-cylinder block design, with cylinders 4 by 6, and rated at 25.4 horsepower. Its cubic displacement approximates 300 inches. The cylinder casting is an L-type design, with both sets of valves on the right, but the intake manifold carried on the left, and connecting with the valve chambers by passing through the waterjacket at two points one between the first and second, and the other between the third and fourth cylinders.

The Accessibility Factor

Accessibility has been aimed at and is evident in many places. One example is the valve cover plate, which is rounded at each end so as to make the valve springs and tappets at the front and rear as accessible as those in the center. The exhaust manifold is sufficiently high, there remaining not a single obstruction to the tappets or valve springs.

Another example of accessibility is that in connection with the transverse shaft at front, which drives the water pump at one end and the magneto at the other, the arrangements are such that this cross-shaft can be withdrawn as a unit after removing the magneto which is held by one clamp, and without disturbing the pump, camshaft, or the timing. Further, the camshaft can be withdrawn without interfering with the cross-shaft or the oil pump, which is driven from the rear end of the camshaft as illustrated in Fig. 3.

A flexible leather coupling with timing adjustment for the magneto is used on the cross-shaft and by means of serrations the cross-shaft is replaced in the crankcase without any attention being given to timing. Any desired setting can be obtained later by use of the fine serrations and the timing adjustment in the coupling.

Cooling the Valve Seats

The waterjacket is designed with care, so that a uniform cooling of the valve seats has been obtained. The intake manifold is carried through the waterjacket to the left-hand side, thus preheating the charge and insuring good carburetion. Having the carbureter and the magneto on the same side with the steering gear gives very simple control connections, as shown in the side view of the motor, Fig. 1.

The crankshaft, 2 inches in diameter, and of very rigid five-bearing design, uses large bearings, the total surface of main and connecting-rod bearings being 52 square inches. The crankshaft, flywheel and clutch are each balanced accurately on a Norton balancing machine.

The cams are integral with the camshaft, which is supported by five bearings. Each bearing comes within 1-8-inch of the cam, thereby eliminating any springing in the shaft. The cams are extremely large, having 1.75-inch base circle, with .5-inch lift, this, together with the large rollers of the valve tappets giving a remarkable silent valve operation. The valves are of tungsten steel.

The valve guides are, contrary to standard practice, not a press fit, but a free fit in the cylinder casting, the valve spring holding them in place. Therefore one does not need a sledge hammer, should it be necessary to remove a valve guide.

For simplicity and silence a single Coventry chain of 2-inch width is used to drive the camshaft. A neat and simple timing adjustment has been provided in the large sprocket. Both sprockets are made symmetrical, so that they can be turned round in case one side of the teeth should have become worn after a number of years.

Renewable Pump Packing

To leave the whole valve side clear from obstructions, and to obtain silent operation, a worm gear drives a cross shaft.

driving the water pump and magneto. The pump is so designed that the packing can be easily renewed without removing the whole pump; an important point, which is nearly always overlooked in cross shaft designs. The pump is carried on a bracket, away from the timing gear housing, so that no water can leak into the crankcase, should the packing become leaky. The packing is also automatically tightened by a stiff spring. The cross shaft is carried on two ball bearings, and the thrust here, as well as in the camshaft is taken by a separate ball thrust.

The connecting-rods are light and long, 14.5 inches between centers, thus greatly reducing the friction of the piston.

60 Pounds Oil Pressure

Lubrication is maintained through a large gear pump, driven by the rear end of the camshaft, thereby avoiding additional chains, gears and bearings. Not only the main, connecting-rod and piston bearings, but also all camshaft bearings are flooded under high pressure, insuring a minimum of wear. Yet not a single pipe is used, as these often come loose or break. The oil pressure is readily adjustable from the outside, and can be carried up to 60 pounds per square inch. Normally the motor runs with 40 pounds. Special provisions have been made to prevent smoking of the motor, at the same time making it very economical on oil.

The main objection against a high location of the oil pump is the inability of the pump, when dry, to suck up oil from the bottom of the crankcase, as it then requires priming from the outside. This has been overcome in the Deltal by using one of the rear arms of the motor as an auxiliary tank which is located higher than the oil pump, so that the latter can never run dry. At the same time the oil is passed here through a filter. It has been a disadvantage in many motors with a filter in the oilbase that all the oil had to be drained before the filter could be cleaned. As this is a nasty job, especially if the dustpan has to be taken off, the filter often was neglected, and probably clogged up, the result being a burned-out bearing.

In one front arm of the crankcase a large filler cap for oil is provided, quickly detachable by giving the knob in the center a quarter turn.

Cooling the Crankcase Oil

The oilpan has cooling ribs on the bottom to keep the oil at a low temperature. Access to all bearings can be obtained in 15 minutes by dropping the oilpan. This also allows to withdraw any piston and connecting-rod after loosening the four connecting-rod bolts.

A web is cast between the arms of the crankcase, extending to the frame and taking the place of a dustpan, which latter makes the lower half of the motor inaccessible, and has often been the cause of fire.

Improved Protection Against Mud and Water in the Modern Car

(*Continued from page 507.*)

the frame members and the bottom of radiator extending to the end of the frame close to the front spring forward pivot.

This last part of the design is easier to obtain now than at any previous time on account of the growing application of self-starting equipment.

To take care of the outside splash, an extended guard alongside the fender with a slightly tipped-in edge, carrying the water to the ground, would be a solution, C, Fig. 2.

A small cut at the forward end would let down the amount of water running toward the front. This disposition allows the cleaning of the inside of the fender with a brush and running water in the garage without undue hardship.

Fig. 2 shows at the left how the general design could be carried out and gives an idea of the appearance after completion.—E. PLANCHE, engineer.

Gets Gronwall Electric Furnace Representation

NEW YORK CITY, Feb. 13—Mr. John A. Crowley, president of the John A. Crowley Co. of New York City, returned from England on Monday and while abroad successfully concluded negotiations for the exclusive representation of the Gronwall Electric steel making furnace for this country.

This furnace is perhaps better known in this country in connection with the ore smelting furnace of the same name which has had such noticeable success in smelting the Swedish ores, but the steel melting and refining furnace has now been brought to a stage where it is being successfully operated in several of the English mills, and is being introduced in the Sheffield section in mills where other electric furnaces have been tried and abandoned.

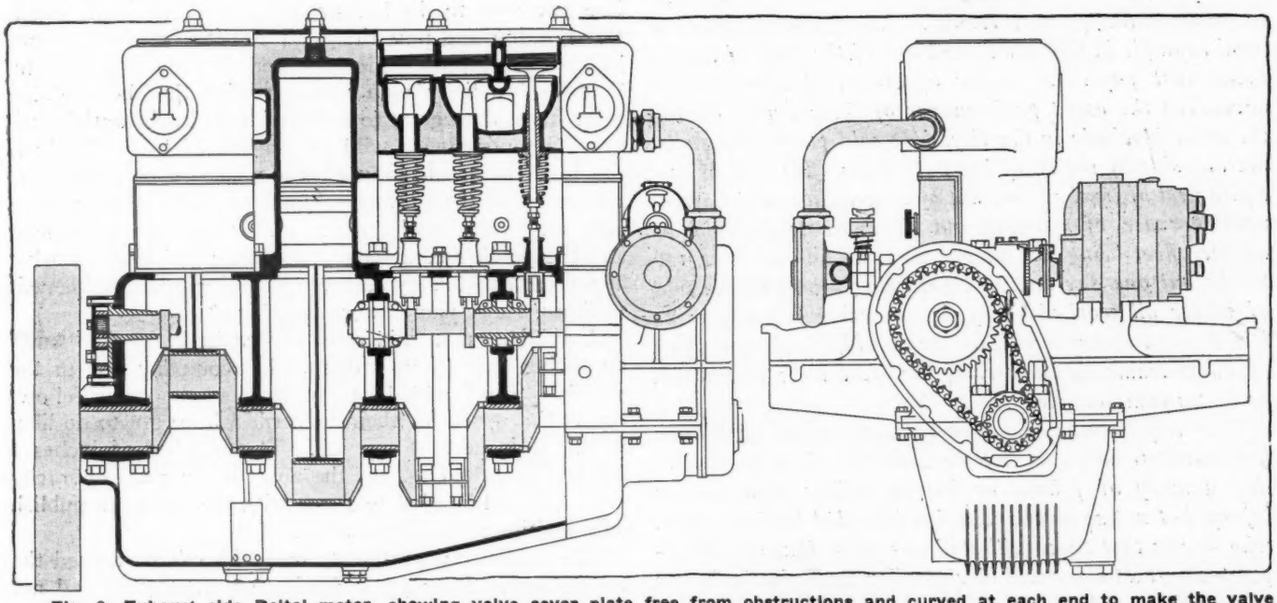


Fig. 3—Exhaust side Deltal motor, showing valve cover plate free from obstructions and curved at each end to make the valve pump and tappets at the end as accessible as those in the center. Note filter to auxiliary oil reservoir in rear motor arm. Fig. 4—End elevation and side section of Deltal motor, showing how valve seats are waterjacketed, how oil pump is driven from rear end of camshaft and how cams are as close to the bearings as possible

The Automobile

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Advertising That Counts

THE advertising that counts is the advertising that brings inquiries. Often the advertisement that brings most inquiries is the one that was expected to produce the poorest results. Last week afforded a good example in Greater New York of the kind of advertising that pays. A maker of electric trucks frankly advertised the exact performance of these trucks during the snow blockade in the city. He told plain hard facts, not one side of the story but both sides. He told of one entire fleet of trucks being out of commission in the afternoon because of running out of current; he told of another fleet being out all one day; he told of over 120 trucks out one day and of eight being towed in; he told of where all worked every day in other industries; he told how in some fleets each truck did double the work of horse teams on the streets the same day; in a word, he told a complete story.

That truth convinces, even in what might be termed unpleasant forms, was well exemplified. It was thought that a story of failure or partial failure would work injury, but not so to the wise hard-headed business man, who knows that snow will stall our finest limited passenger trains, that snow will block trolley traffic in the hearts of our cities and that the best systems of transportation go astray when abnormal traffic conditions are faced.

News That Isn't News

THE automobile industry has been successfully nursed through its days of infancy. To-day it is a robust adult. It no longer needs the publicity pap which is daily and weekly being doled out to it in the newspapers of the country. If the industry could but realize that certain brands of publicity, so called, are the laughing stock of the reader of the daily paper or of the Sunday edition, they would be less keen to insist that it be given as a consideration of the advertising contract.

A line for a line is the slogan of some of the advertising managers of some of the leading automobile concerns, meaning thereby that for every line of advertising space which they buy they expect a line of free space in which to put editorial matter. This scheme of securing space in which to praise the merits of their product in the guise of *bona fide* news matter obtained by the newspaper's own staff has grown into such a business that he is a poor publicity man indeed who does not weigh up one kind of publicity against the other, at least within reasonable limits.

There is room for good publicity from the automobile industry in the columns of the daily press. There is not room for 90 per cent. of that which to-day finds its way into the columns set aside in most enterprising newspapers at least once a week for the automobile industry. The really good material furnished by the publicity departments of the several concerns loses its force and is cheapened by the company it keeps. A story which is brimful of good information and really tells the public something about the automobile industry or any one individual member of it is legitimate publicity and would be read, were it not for the fact that the public is getting so that it does not read much of the automobile column of the daily paper. And why? Because alongside of this real bit of information is a story about John Smith's truck being the finest in the world, or about his new carbureter, which has everything else ever made in the fuel-mixing line relegated to the background. And the public reads this heading and puts the good and the bad in the same basket. It's all alike, they say, and they are largely right.

If the publicity man would realize that he is doing more harm than good to a dignified and substantial business by supporting a wild cat scheme of space filling; if the industry would refuse as a whole to be a party to such a use of the reading columns of the newspaper, then only real news stories about motor cars would appear, and the public's confidence would be regained, and what appeared would carry real weight and would be of benefit to those whose names were mentioned.

A publicity man said recently that he knew the "stuff" appearing was of no value to his company nor to the public. "But," added he, "as long as the other fellows secure this space for their concerns I have got to do likewise. It is part of my job. The number of inches I secure is checked against the amount my contemporaries get. I would be glad to agree with the others to publish only legitimate reading matter."

The publicity departments have the mirror turned the wrong way. They are reflecting on themselves and not convincing the wise motoring public unless they say something.

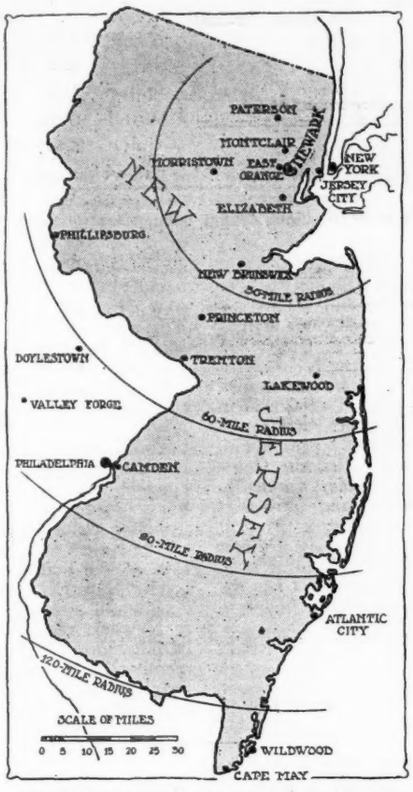
New Jersey Registers 49,588 Cars

Newark Is Trade Center for the State Which Is Coming to the Front in the Number of Car and Accessory Factories—Show Opens With 40 Exhibitors of Cars

NEWARK, N. J., Feb. 23—New Jersey, one of the smallest states in the Union, with a total area of 8,224 square miles, has developed into one of the foremost manufacturing centers. The manufacture of automobiles, trucks and accessories has grown so rapidly in the last few years that the state now ranks with the other prominent states in this industry. With a population of 2,537,167, according to the 1910 census, this state has proved that it is industrially a large center. Though severe in its taxation of automobiles, the registration has increased wonderfully in the last few years and new companies are springing up every day.

There were 49,588 automobile registrations in 1913. The motorcycle licenses amounted to 8,419. The drivers' licenses numbered 55,246. Trucks, weighing over 4,000 pounds amounted to 1,772. The amount collected in car license fees was $442,244.25 and that in driving license fees was $144,418, totaling $661,466.31. The registration transfers were 3,072. At present the approximate proportion of non-resident to resident cars registered in New Jersey is one to five.

Newark's seventh annual automobile show opened in the First Regiment Armory. More than forty different makes of passenger cars, nineteen different makes of commercial vehicles and fifty-eight accessory exhibitions in the accessory department are on display. There are twenty-seven passenger car exhibitors and thirteen commercial car exhibits. The estimated aggregate value of the exhibits has been placed at $1,000,000.



Territory covered by Newark dealers

Jerseymen have always been fortunate in the fact that the shows held in this city have combined in the one exhibit not only all of the leading pleasure cars, but the principal makes of business vehicles as well. As a matter of fact, the Newark show takes rank with the national exhibits which are held annually in New York and Chicago in so far as variety of exhibits is concerned. Many of the exhibits that were specially prepared for the big national shows are shown in Newark in their entirety. Several different makes of cyclecars are on exhibition, including the Imp, Mercury and Economy car. Last year there were 107 exhibitors. There were seventy-three different makes of cars and fifty-eight makes of commercial cars. The estimated total value of exhibits was $750,000. The New Jersey Automobile Exhibition Co., under whose management the show is held, states that there were nearly 5,000 people at the opening.

Gold and white predominate in the decorative scheme. More than 40,000 yards of blue bunting hide the girders and the floor is covered by a maroon carpet.

The Mecca of the State

This city is the automobile trade center for the state. There are seventy-nine dealers, including practically every American car and a number of the important foreign cars.

There is an immense field for the commercial vehicle in this city. At the beginning of this year, over 400 commercial cars and more than 5,200 passenger vehicles were registered. This city ranks with the other large motor truck manufacturing cities, having nine commercial vehicle factories. Over 200 accessory factories are doing a large business in Newark, including Lovell-McConnell, Splitdorf and Hyatt.

There are seventy-three garages, seven repair houses and eleven supply houses doing business.

The manufacturers in Newark say that business is good and the prospects are bright. In the Splitdorf Electrical Co.'s plant a full force of 1,000 men is being kept at work and business is normal. The Riley-Klotz Co., maker of automobile accessories, states that orders are coming in steadily and a brisk trade revival this spring is certain. Some of the concerns state that a conservative estimate on the total business for the year will exceed that of the previous year by from 20 to 25 per cent. A forward movement in trade has set in and the heads of the many and varied industries in Newark are very optimistic.

A majority of the dealers state that their Newark agencies cover practically the whole state, including nearly 8,500 square miles. A few have sub-agencies established, but most of the business comes through the Newark offices.

The car selling under $2,000 seems to be the most popular in point of sales. The largest 1913 sale made was that of the Ford agency, which sold 575 cars. This agency expects to sell about 100 more than this for 1914.

The Cadillac proved to be the biggest seller over $1,000 and under $2,000, its sale being around 300. About 400 are expected to be sold for 1914.

In the large car field, the Pierce-Arrow made a good record, selling eighty passenger cars and fifteen trucks. The Garford made an enviable record in the commercial car field, selling eighty-six trucks. Its passenger car sales were not so large, only fifteen being sold.

The Buick company sold 172 cars for 1913 and expects to sell about 175 for 1914. An average of thirty-five cars was sold by the rest of the dealers.

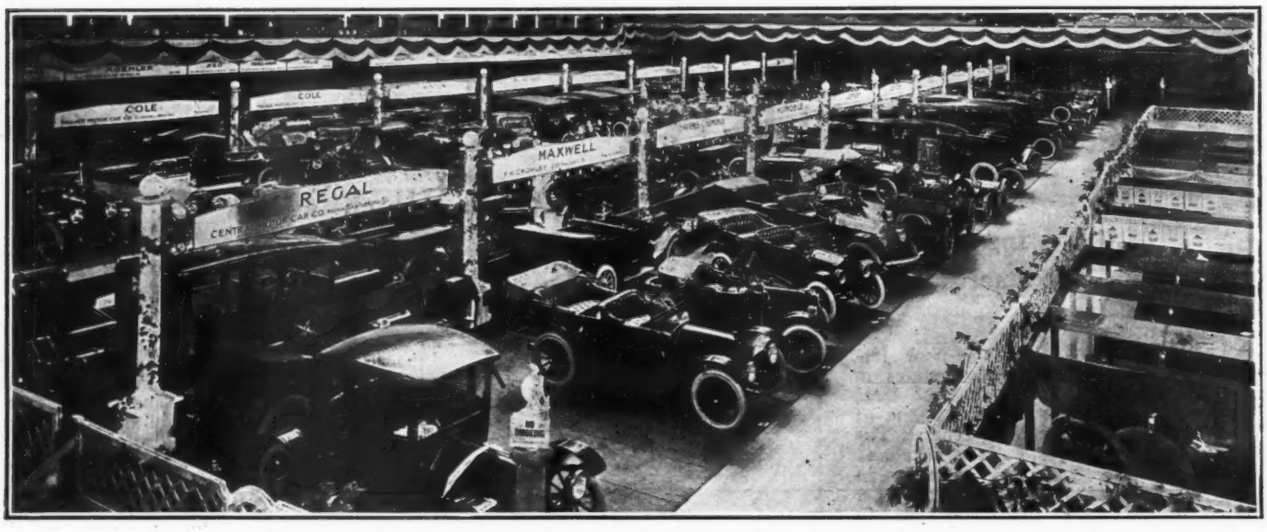
The big industries of Newark are leather and varnish making. For the state the textile industries taken together are the most important of the manufacturing industries. The fisheries of the state are of great commercial value. In these and allied industries, the commercial vehicle is being used in preference to the horse-drawn vehicle. In Newark especially, where there are many long hills, these vehicles do Trojan work.

Good Roads Aid Trade

The roads of New Jersey are always in good condition, over $500,000 being spent annually in new work or construction. The Newark Turnpike, for instance, offers the manufacturer opportunity for the transportation of his products from that city to New York. The Plank road is another example. Instead of loading his wares on freight trains, as was formerly done, the manufacturer is gradually adopting the motor truck as a better means of transportation, within a radius of 100 miles.

This state abounds in beautiful scenery, as well as good roads, a wonderful combination. The total mileage of public roads is close to 90,000, of which nearly 5,000 is macadam, and nearly 10,000 miles are gravel.

New Jersey has assumed a prominent place in automobile manufacturing and allied trades. Over 40,000 men are employed in such industries in that state, in addition to which there are upwards of 1,000 garages, with more than 7,000 employees and 14,000 chauffeurs. Such concerns as the International Motors in Plainfield, Mercer, in Trenton, Simplex in New Brunswick,



View of the Newark, N. J., automobile show, which opened in the First Regiment Armory on Saturday

Torbenson M. C. Co., in Bloomfield and the Vanderwater Co., in Elizabeth, are doing a good business.

There are twelve tire manufacturing concerns in this state. Six of these are located in Trenton, including the Acme, Ajax-Grieb, Empire, Home, Thermoid and the United & Globe tire manufacturing companies. The Michelin company is in Milltown, near Trenton. The Rutherford and the Braender tire companies are in Rutherford while the Carspring Tire Co. is in Jersey City. The Mattson Rubber Co. is in Lodi, while the Hardman company is in Bellville, near Newark. Bloomfield, though a small town, boasts of a tire company called the Combination Mfg. Co. The Simms magneto plant is practically in this city, being on the division line of East Orange and that city. Such large concerns as the Hartford Suspension Co. and the Dixon Graphite Co., are in Jersey City. The big Edison battery plant is in Orange. The Spicer Mfg. Co., manufacturer of universal joints, is in Plainfield. The Holly Motor Co., Mt. Holly, is another concern doing a good manufacturing business in this state.

Right at Newark's doors lie the Oranges and Montclair. Montclair is the third wealthiest city for its size in the United States. Essex County is considered one of the wealthiest counties in the country. These towns are dotted with palatial homes of thousands of New York's successful business men. These men usually wait for Newark's annual show before investing in a new car. Many of the show sales are usually to these people. The wives of these men, instead of using the heavy limousine or touring car, to make their short trips down to the shopping district in Newark, are now using the electric vehicle, instead.

In reviewing the work accomplished during the past year by the local association, the New Jersey Automobile Trade Assn., it may be stated that it has accomplished much. The one big purpose of the association is to weld together all of the automobile and accessory dealers, garage owners and others who are connected in any way with the trade, into one large body in order to protect them and the 50,000 motorists of the state against unjust legislation, for the improvement and better maintenance of the state's highways, and for the advancement of such legislation as will tend to improve both trade and motoring conditions.

The Newark Motor Club, the New Jersey Automobile Trade Assn., and a number of independent automobile accessory dealers in Newark, recently formed a new organization under the name of The Essex County Automobile Club. The club starts with a membership of about 150. Headquarters will be opened in the near future at Newark, from which touring information and other data will be furnished to the members.

Kansas City To Sell Cars Worth $35,000,000 This Year

KANSAS CITY, MO., Feb. 23—The great Southwest demonstrated to motor dealers last week that it would buy more motor cars this year than ever before. The local show held by the Kansas City Automobile Dealers' Association closed Saturday night after a week of record attendance, sales and enthusiasm. The 3,000 dealers from the Southwest territory who look to Kansas City as their distributing point reported that the temporary financial strengency caused by the drought last summer had passed, and that they were prepared to increase their sales of last year by at least 25 per cent.

The Kansas City motor sales in 1913 amounted to an approximate $28,000,000. The expected increase this year will bring it to an even $35,000,000.

The local trade territory embraces the western half of Missouri, all of Kansas, southern Nebraska, eastern Colorado, Oklahoma, northwestern Arkansas, northern Texas including the Panhandle and sections of New Mexico and Arizona. Figures advanced by the local dealers' association show that this territory ranks third in the United States as an automobile section.

Kansas last year bought motor cars and accessories to the value of $16,500,000 despite the drought. Today a few more than 34,000 cars are owned, principally by farmers, there.

Practically all of that business came through Kansas City, and handled by the seventy-eight dealers in automobiles and trucks and the fifty-five dealers in accessories. One company sold 5,000 cars out of its Kansas City branch last year and another 3,000.

One tire company here estimated its last year's business at $3,000,000, another an even million. The value of the tire business here is evidenced by the fact that four new tire agencies have been opened here in half as many months.

The show was only one of the trade attracting methods of the Kansas City dealers' association.

The representative car of the Southwest is one costing about $1,000, a five-passenger touring car, adaptable to country roads. It is a well known fact that the largest percentage of Kansas owned cars are owned on the farm. The farmer demands a light strong machine, capable of carrying supplies to and from town, but still being usable as a pleasure car. He wants plainness and service. When that is demonstrated, the Kansas farmer will purchase and then only.

In the cities the car averages higher, probably as much as $1,800.

"Every dealer has reported to me that his business has been much larger this year than during the corresponding time of 1913," J. F. Martin, president of the local association, said a few days ago. "In December many persons were viewing the outlook with alarm. Our district had suffered its worst financial troubles since the panic of 1907. One or two factory branches were closed and the agencies either discontinued or turned to other dealers. Then the new year opened with better prospects. Cars began selling at once and now even the most pessimistic dealer is convinced that 1914 will be our banner year."

One dealer sold 200 cars during the show week, bringing the total for January and February to an approximate 400. It is estimated that 1,200 cars already have been sold from Kansas City this year.

Only one car is manufactured in Kansas City. That is the Stafford, a pleasure car, of which 125 will be made this year. An assembling plant of the Ford company employing about 250 ment and which is being doubled in capacity also is located inside the limits of Kansas City.

Business at Hartford and Indianapolis

HARTFORD, CONN., Feb. 21—With every prospect of success the seventh annual show of the Hartford Automobile Dealers' Assn. was formally opened in the Park Casino at 8 o'clock this evening by Mayor Louis R. Cheney. This 1914 show offers a big contrast to the show given a year ago. It is about one-third the size, though about the same number of dealers have displays, but no trucks are shown. The idea this year is not to attract a big throng. On the contrary, the show is planned as an "all business" exhibition.

This 1914 show is truly representative of the American industry. The lowest-priced car on display is the Imp cyclecar, the highest-priced being the Pierce-Arrow, Packard, Peerless and Stevens-Duryea. As Hartford is the natural trading center for a large outside territory a good attendance is certain.

Thirty-three different makes of gasoline cars are shown and of these sixteen are six-cylinder types. There are three different makes of electric pleasure cars on display. There is one motorcycle exhibit and there are four accessory exhibits. All cars are on the one floor and all spaces are the same size save a few in the annex and the rooms at the north and southwest sections of the building.

Prospects Are Bright

Prospects of a good year are very bright. The 1913 season showed a material gain over the previous selling year and from the sales reported by the dealers to have been made to date 1914 will be a record-breaker. Most of the Hartford dealers sell at retail and several have sub-agents. The Ford dealer has sub-agents in four counties, the Reo dealer in five counties, as many for the Chalmers and Saxon dealer, who, with the latter car, also has two towns in New Haven county. One dealer has the entire state for the Paige. Hartford county is a sufficiently good territory to keep the dealers limited to this area very busy throughout the selling season.

There are thirty car dealers in Hartford. Twenty-two of these are members of the Hartford Automobile Dealers' Assn. Twelve of these thirty dealers sell trucks and report a good business.

The local electric light company, which is not considered in the foregoing has been eminently successful in placing electric trucks, forty-six of one make now being in service. The company rents battery service which rather curtails the prospects of other dealers in placing electric trucks.

There are six dealers in electric passenger cars, one of whom sells electric trucks when he has the opportunity.

There are four supply houses, in the strict acceptance of the term. Hartford is the headquarters of one house, the Post & Lester Co., all branches being supplied from this city.

There are seventeen garages in Hartford and as many service stations. Service has become, locally, a deciding factor in the sale of cars.

May Sell 2,797 Cars in 1914

From information given out by the local dealers, 1,917 cars were sold during the 1913 season, and 492 cars are reported to have been sold or delivered in 1914 to date, the estimate of sales for the entire 1914 season amounting to 2,797 cars.

Hartford county is a productive manufacturing area. More and more each year the motor car is being adopted by the agriculturists who, unfortunately for the good of the community in general, go in principally for tobacco, and farming, in the strict sense, is becoming a lost art. Dairy farming is holding its own. Go where one will, the tiller of the soil has a motor car of up-to-date vintage tucked away in his barn. Garages are increasing for the Hartford county farmer of tobacco makes his money in a comparatively short season. The Hartford county farmer may consider a car for a long time but he usually gets one and once he buys he is a good customer for that dealer who treats him squarely. In fact, the local dealers are now working the country towns more aggressively than ever before.

The Ford is the popular car. The local dealer, who distributes in four counties through sub-agents, sold 900 cars in 1913. He has contracted for 1,200 cars for the 1914 season. Reo and Studebaker are about even while the Cadillac is next, followed closely by the Buick and Overland. All six cars have sold well this year. Last year 304 Fords were retailed in Hartford with 113 Cadillacs and 120 Reos.

Of the late comers the Imp cyclecar, the Saxon, the Grant, the Metz and the Chandler six are prominent.

INDIANAPOLIS, IND., Feb. 23—The annual show, under the auspices of the Indianapolis Automobile Trade Assn., began today and will continue all week. Each concern is exhibiting in its own place of business, except that a few companies have found it advisable to take temporary quarters closer to the downtown district for the week.

Last year a combined show under one roof was given in the coliseum at the state fair grounds. The worst flood in the history of the city made it impossible to reach the fair grounds for several days during the show. In 1912 a combined show was given in a tent close to the downtown district. While this was successful financially, the attendance was not as large as it would have been had there been warmer quarters. The city has no building large enough that is accessible to the center of the city.

So until the city can provide a suitable building large enough and warm enough, the dealers and manufacturers are going to follow the old plan of each concern exhibiting in its own quarters. Forty dealers are showing fifty-five different makes of cars in 180 models. In addition probably fifty concerns handling accessories and sundries are exhibiting.

The Ford branch will have a special display of motion pictures, including pictures taken at the factory, the 1913 500-mile motor car race in Indianapolis and a Ford climbing Mt. Nevis.

One of the most interesting features will be the parade to be held for old and new models tomorrow. Prizes are to be awarded to the oldest cars in line and to the concern having the largest percentage of models that had ever been manufactured by the companies they represent, in line.

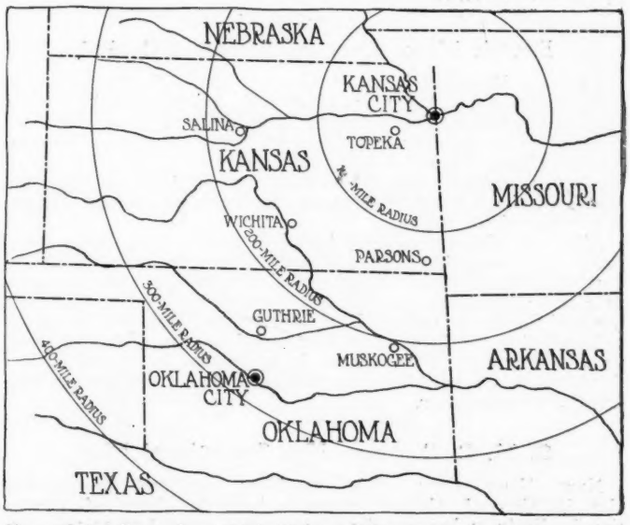
St. Louis Nets $500,000

ST. LOUIS, MO., Feb. 26—St. Louis' second automobile show and the ninth exhibition of its sort in this city closed Sunday and according to Manager Frank Bishop was a huge success. The committee announced it would in all probability hold a show in the fall in opposition to the regular fall show of the St. Louis Dealers' and Manuafcturers' Assn., and that it was certain another spring show would be conducted here next year. Manager Bishop said that the show had netted the dealers approximately $500,000 worth of business.

Will Stick to Spring Show

The exhibitors, each of whom is barred from participation in the fall show, announce they are ready to pledge their all to make the spring show an annual success and report they will stick to the last.

During the seven days, February 9 to 15, many contracts to handle cars and different makes of automobile supplies were let, the Pathfinder company contracting for 138 cars.



Map of territory for which Kansas City is the car-distributing center

Klaxon Co. Gets Horn Injunction

Court Issues Preliminary Decree Against A. Elliott Ranney Co.—Decrees Against Accessory Men

NEW YORK CITY, Feb. 20—Judge Ward, today, granted a preliminary injunction to Lovell-McConnell Mfg. Co. against A. Elliot Ranney Co., New York distributors for the Hudson cars, preventing the delivery of Hudson cars fitted with the Sparton hand-operated horns. The case arises from the recent decision from Judge Chatfield which upheld the Hutchinson patents and the present suit was brought about by the fact that Hudson cars are regularly sold equipped with Sparton horns which Judge Ward considers an infringement of the Klaxon patent. The present injunction applies only to the distribution of cars in New York City.

The Lovell-McConnell Co. brought a motion for preliminary injunction against the Hudson dealer on January 27, alleging that the infringement consisted of the sale of Hudson cars equipped with the Sparton horn as well as the sale of horns separate from the car.

A motion for an interlocutory decree has been granted by Judge Hand in the United States District Court for the Southern District of New York, in the Lovell-McConnell suit against the Imperial Automobile Supply Co., National Automobile Supply Co., Thirty-Five Per Cent. Automobile Supply Co., American Auto Supply Co., Chas. E. Miller, and the Crane & Wagner Auto Supply Co. The present decree is the same as in the Brooklyn Court against the Newtone manufacturer and orders an accounting of profits and an injunction against future sales of Newtone horns by these companies.

Claims Kantalever Spring Repairer Infringement

NEW YORK CITY, Feb. 19—The Motor Car Equipment Co., sales agents for the Kantalever emergency spring repairer and sole owner of the basic patent, has brought suit for an alleged infringement of patent No. 902,250, issued to D. P. Power, Oct. 27, 1908, by the Auto Surplus Stock Syndicate, a dealer in the Auto spring repairer.

The Kantalever spring repairer is manufactured by the Electra Mfg. Co., of this city. This emergency repairer will hold intact any broken spring and carry any load without sacrificing the resiliency of the spring. It consists of a straight and a dropped plate which are placed above and below the damaged spring portion and are held there by means of two angle brackets kept tight on the plates by means of nuts engaging their threaded ends. The complainant alleges that the defendant's product looks and works like the Kantalever repairer, and asks for an injunction and costs.

Detroit Motor Concern Increases Capital

DETROIT, MICH., Feb. 24—It became generally known here today that the J. S. Bretz Co., New York, has purchased the controlling interest in the Massnick-Phipps Mfg. Co., of this city, the sale being made on September 13, 1913. The latter concern has long been established in this city and does contract machine work, principally the manufacture of automobile parts. The net worth of the concern is $152,000, according to present rating. It employs about 100 men.

Although Walter Phipps still appears as president of the company, his interest has been absorbed entirely by Bretz, as has a portion of that formerly held by F. C. Massnick, secretary, treasurer and general manager. Robert Perkins would make no statement of the future policy of the concern, and it cannot be stated as to whether the Bretz control will tend to enlarge the scope of its manufactures. The concern is at present interested in the development of a cyclecar motor. and also manufactures the Lavigne steering gear.

G. M. C. Common Has Sensational Rise

NEW YORK CITY, Feb. 21—The sustained spectacular rise in General Motors common is little short of sensational. Early in January the common was quoted at 37 3-8. At last Thursday's high of 75 3-4 there has been an advance of 38 3-8 points, an appreciation of more than 100 per cent.

On October 15, 1915, there will be about $7,500,000 of notes coming due. While there is no doubt that the conservative forces which have been shaping the General Motors Co. financial program have planned all along to wait until 1915 to begin common dividends, it is perhaps a question if they will be allowed to wait that long. Pressure is pretty certain to be exerted to force a small common dividend after the close of the current fiscal year, July 31 next. And especially if the prospects favor big earnings in 1915 the pressure will become very strong.

There is only $31,000,000 of preferred and common stock and the entire capitalization including notes is but a trifle over $40,000,000 with which the company is doing a gross business of $90,000,000. On its average capital the company is earning 20 per cent.

In 3 years, General Motors has charged off $10,000,000 from inventory account, has retired between $5,000,000 and $6,000,000 of notes from earnings and charged at least $1,000,000 per annum to depreciation account besides financing heavy property expansion work entirely out of earnings.

To Investigate A. A. A. Lobby

WASHINGTON, D. C., Feb. 25—*Special Telegram*—An attack on the American Automobile Assn. was made in the House of Representatives yesterday by Congressman Shakleford. He claimed it maintained an "editorial canning factory" to promote the measures it favored. Also that it maintained a "nefarious lobby" here and collected funds to fight re-election of opponents of motor road bills. Immediate investigation of Shakleford's assertions was proposed by Congressman Borland in a resolution for a committee of five introduced after Shackleford finished his speech.

Ford Builds 23,936 Cars in January

DETROIT, MICH., Feb. 23—January, 1914, shows the largest output of any month in the entire history of the Ford Motor Co. During this month the company built and shipped 23,936 cars. The largest month's output previous to this was June, 1913, when the number of cars made and shipped reached the total of 22,049.

Automobile Securities Quotations

There were few changes in this week's securities quotations. Firestone Tire & Rubber common rose 10 points, while General Motors common rose, this time 9 points. Kelly-Springfield Tire preferred, rose 5 points. The stock of the Miller Rubber Co. rose 4 points.

	1913 Bid	1913 Asked	1914 Bid	1914 Asked
Ajax-Grieb Rubber Co., com	150	175	200	..
Ajax-Grieb Rubber Co., pfd	95	99	99	102
Aluminum Castings, pfd	100	101	97	100
Chalmers Motor Company, com	..	..	84	87
Chalmers Motor Company, pfd	..	..	92	94
Firestone Tire & Rubber Co., com	265	275	280	290
Firestone Tire & Rubber Co., pfd	103	105	108½	109½
Garford Company, preferred	99	100	80	90
General Motors Company, com	32	32½	69	70
General Motors Company, pfd	74	75	92	93
B. F. Goodrich Company, com	37½	39	22½	23½
B. F. Goodrich Company, pfd	94	96	88	90
Goodyear Tire & Rubber Co., com	365	375	212	218
Goodyear Tire & Rubber Co., pfd	..	100	96½	98½
Gray & Davis Co., preferred	..	..	90	97
International Motor Co., com	5	15	..	5
International Motor Co., pfd	35	55	..	15
Kelly-Springfield Tire Co., com	..	..	..	..
Kelly-Springfield Tire Co., pfd	..	..	..	..
Kelly-Springfield Motor Truck Co., com	..	..	55	56
Kelly-Springfield Motor Truck Co., pfd	..	..	125	130
Lozier Motor Company, com	..	..	12	15
Lozier Motor Company, pfd	..	..	..	65
Maxwell Motor Company, com	..	..	5½	6
Maxwell Motor Company, 1st pfd	..	..	28½	29
Maxwell Motor Company, 2nd pfd	..	..	9¾	10¼
Miller Rubber Company	150	160	129	131
New Departure Mfg. Co., com	..	..	120	125
New Departure Mfg. Co., pfd	..	..	103	106
Packard Motor Company, pfd	102	105	96	98½
Palmer & Singer, pfd	..	..	..	65
Peerless Motor Company, com	..	..	..	30
Peerless Motor Company, pfd	..	..	..	80
Pope Manufacturing Co., com	..	30	1	3
Pope Manufacturing Co., pfd	..	75	12	..
Portage Rubber Co., com	..	..	..	40
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	11½	12½	7½	8½
Reo Motor Car Company	20½	21½	18	18½
Rubber Goods Mfg. Co., pfd	104	107	105	115
Splitdorf Electric Co., pfd	..	..	40	50
Stewart-Warner Speedometer Co., com	..	..	56	57
Stewart-Warner Speedometer Co., pfd	..	..	98	100
Studebaker Company, com	28	29¼	26	27
Studebaker Company, pfd	88	93	82	83
Swinehart Tire Company	88	95	69½	70½
U. S. Rubber Co., com	..	8	59	60
U. S. Rubber Co., 1st preferred	..	65	101	102
Vacuum Oil Co	..	..	212	217
White Company, preferred	103	107	107	110
Willys-Overland Co., com	61	67	67	69
Willys-Overland Co., pfd	91	98	95	97

1913 Goodrich Net Profits $2,599,747

Equals 83 Per Cent. on the $60,000,000 Common Stock, Deducting Preferred Dividend

NEW YORK CITY, Feb. 25—The B. F. Goodrich Co. has issued its report for the year ended December 31, 1913, showing net profits of $2,599,747. This is equal to 83 per cent. on the $60,000,000 common stock after deducting the preferred dividends of $2,100,000. The previous report covered the 9 months ended December 31, 1912, compares as follows:

	Year ended Dec. 31, 1913	9 Mos. ended Dec. 31, 1912
Net sales	$39,509,347	$37,538,861
Manufacturing selling and general admin. exp.	36,451,234	33,814,527
Net profit from operation	3,058,113	3,719,334
Miscellaneous income	491,317	571,845
Total income	3,549	4,291,179
Depreciation	541,358	440,852
*Red. of preferred stock	168,417	.....
Interest and bills payable	239,907	327,838
Net profit	†2,599,747	3,522,489

*Reduction of treasury preferred stock from cost to par value.

†Equal to 83 per cent. on $60,000,000 common stock after deducting preferred dividends of $2,100,000.

The consolidated balance sheet of the B. F. Goodrich Co., as of December 31, 1913, compares as follows:

Assets

	1913	1912
Real estate, buildings, plant, good will, etc.	$71,060,802	$70,685,722
Investments in other companies	1,197,058	1,635,958
Preferred stock in treasury	2,058,700	2,227,117
Societe Francaise B. F. Goodrich	570,987	.....
Current assets	19,401,460	24,007,698
Deferred charges to operate	222,950	229,619
Total	$94,511,957	$98,786,114

Liabilities

Common stock	$60,000,000	$60,000,000
Preferred stock	30,000,000	30,000,000
Current liabilities	3,505,974	7,679,879
Reserve for contingencies	300,000	300,000
Surplus	705,983	806,235
Total	$94,511,957	$98,786,114

It was stated by President B. G. Work that in compiling the balance sheet and profit and loss account accompanying this report, several changes have been made which warrant comment. The 20,587 shares of preferred stock of the company, held in the treasury, have been written down $168,417, which amount is shown separately in the profit and loss account. The decrease of $3,611,712 in merchandise inventory is due to decreased cost of crude rubber, and decreased price of finished product and goods in process of manufacture. It does not reflect any marked change in the volume of material or goods on hand. The reduction of $4,173,904 in current liabilities measures both the progress of the company in respect to financial strength, and the decrease in borrowed money, as a result of lower prices.

Low Prices Lead to Expansion

The establishment of crude rubber, it was stated, on a commercial basis, rather than a speculative basis, and at the same time on an average price basis lower than in former years, is leading to great expansion of the industry in lines of manufacture, the growth of which was very slow on the former high price basis.

The Wire Wheel Controversy

NEW YORK CITY, Feb. 24—The present controversy between the George W. Houk Co., Buffalo, and the Standard Roller Bearing Co., Philadelphia, American licensees for the manufacture and sale of Rudge-Whitworth detachable wire wheels in America, which controversy was started when George W. Houk purchased the property of the McCue company in Buffalo, for the manufacture of a lower-priced model of detachable wire wheel than that manufactured by the Standard Roller Bearing Co., is still in an unsettled condition due to the difficulties of apparently getting satisfactory reports from Rudge-Whitworth, Ltd., Coventry, England, from which concern Houk and the Standard Roller Bearing Co., hold their licenses.

One thing remains certain and that is, that under date of October 5, 1912, there was duly signed and delivered a contract between Rudge-Whitworth, Ltd., and the Standard Roller Bearing Co., and the George W. Houk Co., whereby Rudge-Whitworth "granted unto the licensees, the power to manufacture or have manufactured for them and sell detachable wheels for motor vehicles."

By the contract these American licensees have the exclusive privilege of the patents during their life, together with all improvements made.

By the provisions of the contract "The licensees agree not to manufacture wheels or portions otherwise than with first-rate labor and materials and according to designs approved by Rudge-Whitworth, and that any modifications or alterations made during the term of the agreement must be submitted to Rudge-Whitworth for their approval and that such approval shall not unreasonably be withheld.

It is this factor of Rudge-Whitworth approving the Houk wheel which seems to be one of the points of issue at present. In the Houk wheel brought out during the past fall, a simplified locking device operating on the Rudge-Whitworth principle is used. Rudge-Whitworth made a test of this wheel and discovered that the locking nut worked loose in the test. Based on this fact the Rudge-Whitworth announced that it would not approve of the wheel. Investigations made at Coventry, England, where the wheel was tested, have shown, according to John Pugh, general manager of Rudge-Whitworth, that the wheel being tested was mounted on the wrong side of the car; in other words that the locking device was to the left side and that the wheel was put on the right. Naturally with such an error there would be nothing to prevent the wheel working loose. Mr. Pugh is further authority for the fact that he tested the wheel in company with Mr. Houk recently, and that the locking device was entirely satisfactory.

At present it would seem that the courts will have to decide whether the George W. Houk Co. has under the contract of October 5, 1912, the right to engage separately in the manufacture of wire wheels carrying the name of Rudge-Whitworth. Under the first article of the contract it is stated that permission was granted the Standard Roller Bearing Co., and the George W. Houk Co., "to manufacture or have manufactured for them" detachable wire wheels.

Splitdorf Electric Takes Control of Apple

DAYTON, O., Feb. 21—The Splitdorf Electrical Co., Newark, N. J., has taken over the control of the Apple Electric Co., Dayton, O., so the factory of the latter organization will not be moved from this city. The Apple product will continue to be made by the Apple company under the same name, the officers will not be changed. If the conditions warrant it steps will be taken to enlarge the capacity of the plant.

Market Changes of the Week

There were only five changes in this week's market reports. Tin dropped to $38.38 at a loss of $0.75 per 100 pounds. Fine Up-River Para dropped $0.02. Antimony dropped $0.00 1-4. Electrolytic copper rose $.00 1-8 while that from the Lakes dropped $0.00 1-4 per pound.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.06	.06	.06	.06	.06	.05¾	— .00¼
Beams and Channels, 100 lbs.	1.36	1.36	1.36	1.36	1.36	1.36	.....
Bessemer Steel, ton	21.00	21.00	21.00	21.00	21.00	21.00	.....
Copper, Elec., lb.	.14½	.14½	.14⅝	.14⅝	.14⅝	.14⅝	+ .00½
Copper, Lake, lb.	.14¾	.14¾	.14½	.14½	.14½	.14½	— .00¼
Cottonseed, Oil, bbl.	7.05	7.00	7.00	7.03	7.05	7.05	.....
Cyanide Potash, lb.	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.16	.16	.16	.16	.16	.16	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	4.00	4.00	4.00	4.00	4.00	4.00	.....
Linseed Oil	.52	.52	.52	.52	.52	.52	.....
Open-Hearth Steel, ton	21.00	21.00	21.00	21.00	21.00	21.00	.....
Petroleum, bbl., Kansas crude	1.05	1.05	1.05	1.05	1.05	1.05	.....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.59	.59	.59	.59	.59	.59	.....
Rubber, fine Up-river, Para	.77	.76	.76	.76	.76	.75	— .02
Silk, raw Italy	....	5.15	....	....	5.15	5.15	.....
Silk, raw Japan	....	4.30	....	....	4.30	4.30	.....
Sulphuric Acid, 60 Baume	.90	.17	.90	.90	.90	.90	.....
Tin, 100 lb.	39.13	39.88	39.25	39.20	39.15	38.38	— .75
Tire Scrap	.04½	.04½	.04½	.04½	.04½	.04½	.....

Case Adds $12,000,000

Arranges for Issue of Bonds to That Amount—Will Refund Present Obligations of Company

RACINE, WIS., Feb. 23—The J. I. Case Threshing Machine Co., Racine, Wis., capitalized at $80,000,000, has arranged with eastern financial interests for the issue of $12,000,000 in first mortgage bonds maturing serially from December 1, 1914, to December 1, 1926, and bearing 6 per cent. interest. The sale of the issue means the practical refund of the Racine company's current obligations, which are somewhat in excess of normal due to the abnormal expansion of business and unfavorable financial conditions generally throughout the business world. The issue insures financial independence for a long period. The interest on the issue will make an additional fixed charge of $720,000 per annum. The sucessful negotiation of the serial issue is greeted with enthusiasm, particularly in southern Wisconsin, and adds confidence to that born of the Mitchell-Lewis Motor Co.'s successful financing of its $10,000,000 motor car business last week by the sale of its vehicle interests, thus adding $2,700,000 to its operating capital and enabling it to liquidate its entire gold note issue, due August 1, 1914, in advance. Both Case and Mitchell-Lewis are large producers of pleasure cars, the former putting out 3,600 and the latter approximately 6,000 cars annually.

To Build 3,000 Twombly Cyclecars

NEW YORK CITY, Feb. 24—The Twombly Car Corp., of this city, has arranged contracts with the Driggs-Seabury Ordnance Corp., Sharon, Pa., to build 3,000 Twombly light cars which will retail at $395. According to contract arrangements demonstrating cars will be delivered on or about May 15, and beginning with June deliveries will be made at the rate of 500 to 600 per month.

The Twombly light car is a tandem seater, with 38-inch tread, and 100-inch wheelbase. It is fitted with 28 by 2 1-2-inch clincher tires and has 9-inch road clearance.

Spring suspension is by using 30-inch semi-elliptics in front and 36-inch cantilevers in rear, these in conjunction with an underslung frame arrangement.

The front axle is an I-beam forging of chrome nickel steel and the rear axle is a live type with a solid shaft extending from wheel to wheel and with a differential at one end. The transmission is a three-speed friction with a two-speed planetary gear on the cross shaft carrying the friction wheel. From this shaft a single chain transmits to the rear axle, this arrangement giving six speeds forward and two reverse. The motor is a four-cylinder, block type, water-cooled with thermo-syphon circulation. It is rated at 15 horsepower, and is 2 5-8 x 4 inches bore and stroke. The car is rated at a maximum speed of 50 miles per hour, is listed to weigh 600 pounds and has a claimed gasoline consumption of 40 miles per gallon.

SHARON, PA., Feb. 17—John Stevenson, Jr., was re-elected president of the Driggs-Seabury Ordnance Corp. at the annual meeting held today at the offices. Former State Senator William Flinn, of Pittsburgh, was chosen vice-president; S. B. Pratt, secretary, and Harry Myers, treasurer. The same board of directors were re-elected. At the present time there are $1,500,000 in unfilled orders on the books for automobiles and automobile parts. The company will in a short time be ready to furnish employment for 300 additional hands.

NEW YORK CITY, Feb. 24—The Public Service Express, Inc., this city, has placed an order with the Stegeman M. C. Co., Milwaukee, Wis., for fifty of its trucks; twenty-four 1-ton and two 3-ton.

To Make Alter Car for $600

DETROIT, MICH., Feb. 21—The Alter Motor Car Co. has been quietly in the process of formation in the center of the industry for some time, although its plans are just now coming to light. F. M. Woodard, sales manager of the new company, states that the concern has secured a 26-acre tract of land in the village of Plymouth within 35 minutes of Detroit and is now erecting a factory on the same for the purpose of producing cars under the trade name of Alter in large quantities.

The Alter, according to the advance specifications, is to sell for $600 with equipment, electric starter and generator being $85 extra. It has all the appearance of the medium priced semi-light weight car, and is equipped with a five-passenger body on a 106-inch wheelbase. The tread is standard, while the weight is 1,750 pounds.

The motor, a 3 3-4 by 4 1-2-inch block type, 22 horsepower, uses thermo-syphon cooling. The gearset is a three-speed one, and the drive by shaft, axle reduction being 3 3-4 to 1. Rear springs are scroll elliptic. The frame and method of suspension are conventional. The rear axle is semi-floating, steering on the left and the gasoline tank is placed under the cowl to give a free flow of gasoline under all conditions.

The officers are: Guy Hamilton, president; C. A. Alter, vice-president; R. A. Skinner, secretary and general manager; and R. S. Todd, treasurer. The main offices of the concern are located in Detroit.

Pridemore Cyclecar on Market

NORTHFIELD, MINN., Feb. 24—The Pridemore cyclecar, designed by W. A. Pridemore of the Pridemore Machine Works, Northfield, Minn., has foreign lines with a positive drive instead of belts. Friction transmission is employed with final drive by chains to the rear wheels, with a differential in the jackshaft. The chassis weighs 450 pounds and the car complete 600 pounds. The car is made tandem seat, roadster side-by-side seat, and delivery type. A twin-cylinder, air-cooled motor is used 12 to 14 horsepower. The base is 100 inches and tread 40 inches. The tires, 2 1-2 by 28 inches, are carried on wire wheels, with brakes acting on 8-inch drums on the rear wheels. The steering is by pinion and sector and the controls are on the cowl board. The frame is channel steel, braced rigidly and is underslung, with a clearance of 9 inches. The axles are seamless steel tubular type with drop forged steering knuckles. F. W. Skinner has charge of the sales.

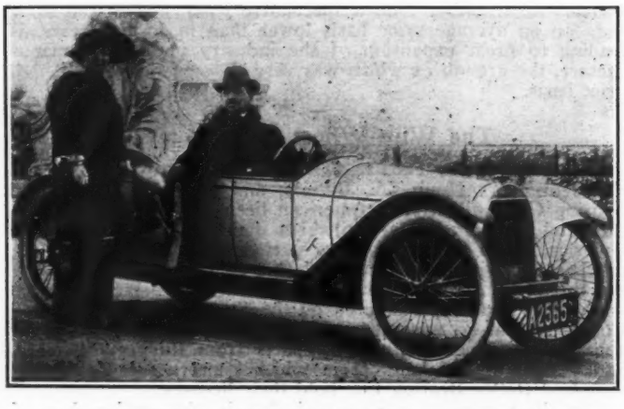
To Appeal in Carbureter Case

CHICAGO, ILL., Feb. 24—The John A. Bender Co., Chicago agent for the Keeton car, and defendant in the recent suit won by the Stromberg Motor Devices Co. for marketing its cars equipped with the Zenith carbureter, which was held to be an infringement of the Ahara patent owned by the plaintiff, has signified its intention of appealing the decision granted by Judge Sanborn in favor of the Stromberg company.

The appeal will come before the Circuit Court of Appeals at Chicago some time this spring.

Pope Planning a Reorganization

HARTFORD, CONN., Feb. 23—Colonel George Pope, as receiver of the Pope Mfg. Co., continues to operate the plant. Judge Gardner H. Greene of the superior court has been asked to accept the receiver's report which covers the January business. The January business under the receivership showed a slight falling off. On February 1, Colonel Pope as receiver had $101,935.38 as against $106,091.67 on January 1. During January the receiver received $36,997.58 for the sale of products from the Hartford factory and this shows a gain over the December period. In January the receipts from the sales of tools, machinery, etc., were $7,350.50. The factory pay roll last month amounted to $30,088 while the December pay roll amounted to $19,337.72 which is sufficient evidence that the working force has



Twombly cyclecar which will be built in quantity this year

been increased during the past month. Colonel Pope does not discuss the future of the company other than to state that plans are being considered for a reorganization. All effort is now centered in the Model 35 four cylinder car, a large number of which are to be built this season.

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Knox Property to Be Sold

SPRINGFIELD, MASS., Feb. 20—The entire property of the Knox Automobile Co., located in this city will soon be sold at either private sale or public auction according to an announcement made today by Chas. G. Gardner, trustee for the company. This company has been operating under bankruptcy for over a year, the receivership dating from January 21, 1913. The announced sale will include the factory in this city together with all its machinery, fixtures, supplies, parts, completed cars, and those in process of construction. Offers for the whole or any part of the real estate or personal property will be considered and the buyer of the plant acquires the good will of the company and the use of the Knox name.

The trustee's statement of assets dated November 30, 1913, shows the following assets:

Real estate	$298,012.49
Machinery and equipment	224,874.83
Agency equipment	5,000.00
Patterns and drawings	36,936.46
Merchandise inventory	859,337.78
Unexpired insurance	8,000.00
Accounts receivable (net)	186,586.65
Cash	15,666.68
	$1,634,414.89

In speaking of the announced sale, Trustee Gardner says:

"Since the company's bankruptcy, beginning with January 21, 1913, the gross business done amounts to $1,250,242.41, and considering general business conditions and the inevitable handicap of a concern operating under the direction of the Court, this is a favorable showing. The past few weeks have shown an increase in the number of orders received and the outlook for future business is encouraging.

"The factory is equipped for the manufacture of motor vehicles, including the Knox-Martin tractor and various kinds of fire apparatus. Since the receiver took hold fire apparatus has been sold to the value of $269,400, and tractors to the value of $392,250."

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Decrease in England's 1913 Imports

NEW YORK CITY, Feb. 21—The importation of automobiles by Great Britain last year showed a decline from 1912 both in number and value. The total of cars brought in from other countries was 6,820, as compared with 7,272 in the preceding year, while their value was $8,460,225, against $8,889,528. Compared with 1912, when 5,277 complete motor cars of British manufacture were exported, there was an increase of nearly 44 per cent. in the number shipped in 1913, which totaled 7,594. The value rose from $9,848,410 in 1912 to $11,677,020, or approximately 18 per cent.

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Gabriel Snubber Prices Lowered

NEW YORK CITY, Feb. 25—On page 417 of THE AUTOMOBILE for February 12, the prices of the Gabriel rebound snubber were given as $12.50 to $17.50 per pair for passenger cars and $20 to $25 per set for the truck types. These prices were incorrect, the former types costing $7.50, $10 and $12.50 and the truck sizes selling for $12.50 and $15.

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To Repair Hart-Kraft Trucks

YORK, PA., Feb. 21—The machinery and unfinished stock of the Hart-Kraft Motor Co. has been purchased by the Flinchbaugh Mfg. Co., of this city, and the company will engage in the repair of the cars built by the Hart-Kraft company. The Flinchbaugh company manufactures portable and stationary gasoline engines.

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May Hold 200-Mile Race at Fairmount

PHILADELPHIA, PA., Feb. 21—After lying dormant for some time the proposition to revive the Fairmount Park road race was stirred into activity this week by the Quaker City Motor Club. Both Select and Common Councils passed without a dissenting vote a resolution requesting the Fairmount Park commission to grant the Quaker City Motor Club permission to conduct a 200-mile automobile race in the park next Fall.

Ready for the Big Races

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Vanderbilt and Grand Prix Feb. 26 and 28—Bidding for 1915 Races Already Started

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LOS ANGELES, CAL., Feb. 23—The Vanderbilt and Grand Prix races which were to have been run on the Santa Monica course Saturday, February 21, and Monday, February 23, but which were postponed to the 26th and 28th, owing to the continuous heavy rains which have deluged Southern California for the past few days, promise to start with the same list of entries as published in THE AUTOMOBILE 2 weeks ago, except that Mrs. Northam has entered Carlson, driving a Mason, in the Grand Prix.

The races could have been run on the scheduled dates so far as track conditions were concerned but due to the damages caused by the storm, Los Angeles was entirely cut off from the outside world, and running these classics under such conditions would have meant financial ruin so far as the venture was concerned.

Since last Thursday Los Angeles has received no mail from the outside, but communication is opening up and everything will be normal by the 26th. The course shows little damage as the result of the continuous rain. Practice has been going on and Wishart and Pullen in Mercers and Tetzlaff in a Fiat have been making the circuit of 8 1-2 miles at a rate of 87 miles per hour. Anderson and Cooper in the Stutz have made equally fast time.

Dave Lewis has recovered completely from his accident and has returned to the race. He will drive a Mason Thursday and a Fiat Saturday.

The drivers welcome the postponement for they want more practice. Ralph De Palma has only been out once and several of the other pilots have had little time to tune up their cars and learn the course.

It looks now as if all the cars would go to the tape in both races with the exception of the French Delage. A veil of mystery surrounds this entry. It has not arrived as yet and no one seems to know whether it is in this country or not. One story has been published in the local papers to the effect that Omer Toft, displaced as the Delage driver at the eleventh hour by Bert Dingley, had stopped the car in New York because he was not going to be at the wheel of the importation from France. It is intimated by Oldfield and his backer, George Settle, that Toft never went to France to get the car and they offer a reward of $100 for proof that the purchase was made.

Richenbacher and the Mason have been substituted in both the Grand Prix and Vanderbilt cup races for Dave Lewis and the Fiat which figured in an accident in practice last week.

Bidding for the 1915 classics has already started. J. B. Ryall, a former race driver, is here from San Francisco, to secure the Vanderbilt cup event for that city next year. He claims that he can get the Golden Gate Park course for the event which would be made a feature of the Panama-Pacific Exposition. If he fails to secure the Vanderbilt cup sanction, he may try to get young Vincent Astor to put up the Astor cup for a Panama-Pacific Exposition road race. George W. Browne, of Milwaukee, one of the promoters of the 1912 Grand Prix and Vanderbilt cup races, is here in hopes of landing the two classics for the cream city in 1915. Brown claims that the badgers have learned how to promote road races from their rather costly experience in 1912 and that a revival of the events in Milwaukee would be crowned with success.

Following is a handy speed schedule which shows the average speed in miles per hour as compared with the time it takes a car to make one circuit of the Santa Monica course of 8.401 miles.

Lap Time.	M. P. H.	Lap Time.	M. P. H.
8:24 1/10	60	6:27 7/10	78
8:15 4/5	61	6:22 4/5	79
8:07 4/5	62	6:18	80
8:00 1/10	63	6:13 3/5	81
7:53 3/5	64	6:08 4/5	82
7:45 9/10	65	6:04 2/5	83
7:38 1/5	66	6:00	84
7:31 2/5	67	5:55 4/5	85
7:24 4/5	68	5:51 7/10	86
7:18 3/10	69	5:47 3/5	87
7:12 1/10	70	5:43 7/10	88
7:06	71	5:39 4/5	89
7:00	72	5:36	90
6:54 3/10	73	5:32 3/10	91
6:48 7/10	74	5:28 7/10	92
6:43 3/5	75	5:25 1/5	93
6:37 9/10	76	5:21 7/10	94
6:32 4/5	77	5:18 2/5	95

FIRST LOZIER FOUR SHIPPED—With the shipment of the first Lozier four on February 11, the two big Lozier factories at Detroit and Plattsburg received their formal introduction to a quantity production schedule. Sales manager Paul Smith states that with about 5,000 orders on hand for early delivery, Lozier forces will be working full tilt for some time to come.

Production manager Pollard, in charge of the Lozier plants at Detroit and Plattsburg, is arranging his plans to allow for a production of up to forty cars per day. Coupled with this output the plants will probably be operated on double shifts if this is found necessary to meet deliveries.

Troy Co. Erects—The Interstate Machinery Co., Troy, N. Y., has recently erected a large addition to its plant. It buys and sells used machinery and is also a jobber in new machinery.

Brown Clutch Increases—The Brown Clutch Co., Sandusky, O., has been compelled to largely increase its manufacturing facilities. A new concrete building equipped with the latest machinery has been added. It is 150 by 60 feet and will be used as a foundry for the present, but later it is expected that another building will be erected for this purpose, and the building just completed will be the home of the machine department.

Anderson Rolled Gear's Plant—The Anderson Rolled Gear Co., Cleveland, O., has purchased the plant and property held under lease and option by them, and formerly owned by the Cleveland Drop Forge Co. The property is situated in the new Cleveland gas fields and the company has drilled in one well producing 2,000,000 feet per day and has another nearing completion.

Springfield Spring Purchases Plant—A deal has been closed whereby the Springfield Spring Co., Springfield, O., has purchased the site and plant of the Owen Machine Tool Co., on East Pleasant street. The spring company has been looking for a location since the destruction of its plant by fire last December. The capital stock of the com pany will be increased from $25,000 to $60,000 to furnish sufficient capital for the new location and additional machinery.

Kosmath Purchases Miller Designs—The Kosmath Co., of 708 Ford Bldg., Detroit, Mich., has purchased from the receiver of the Miller Car Co., the designs and material which it had on hand at the time of the failure for the 1,000-lb. delivery wagon which it was building. The manufacture of these wagons will be continued by the Kosmath Co., in its factory in Detroit.

Leases Columbus Buggy Plant—The New England Furniture & Carpet Co., Minneapolis, Minn., which has taken one-fourth of the product of the Rayfield Motor Co., or 2,500 of the cyclecars, has leased the former Columbus Buggy Co. plant and will install sales rooms and service station. The company is agent in Minnesota, the Dakotas and the northern counties of Iowa and plans to take the agency for a narrow tread cyclecar also.

Ford's Universal Club—In line with the modern and progressive policy which characterizes its management, the Ford Motor Co. of Canada, through several of its enthusiastic executives has organized a unique welfare and educational society called the Universal Club, the scope and purpose of which make it of considerable significance from a sociological industrial standpoint.

Aluminum Goods' New Plant—The Aluminum Goods Co. of Newark, N. J., has authorized improvements and extensions to its largest plant, that at Two Rivers, Wis., which will make it one of the largest single manufactories of the kind in the world. A three-story addition will be constructed at once for the finishing department and storage, and the entire power equipment is being changed to make the drive electric throughout. This calls for the installation of a new 500 h.p. turbine engine, double the size of the present one, which will be moved to furnish power for the rolling mill.

Newerf Rubber Building Plant—W. D. Newerf, head of the Newerf Rubber Co., has decided that at the corner of Pico and Hope Sts., Los Angeles, will be the site of the new home for this company. The building will be especially designed for the use of a tire house. This concern is also erecting a large plant at Compton, a suburb of Los Angeles.

Ford's Los Angeles Plant Opened—The new Ford assembling plant in Los Angeles, Cal., began operations during the past week in its large new home at Seventh and Santa Fé streets. The plant has a capacity of 100 cars daily. It will supply Southern California, Arizona and Southern Nevada.

The Automobile Calendar—Shows, Meetings, Etc.

Feb. 26	Santa Monica, Cal., Vanderbilt Cup Race.
Feb. 21-28	Newark, N. J., Automobile Show, N. J. Auto Trade Assn.
Feb. 21-28	Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Feb. 23-28	Danville, Ill., Vermillion Co. Auto Show.
Feb. 23-28	Indianapolis, Ind., Auto Show, Indianapolis Auto Trade Assn.
Feb. 23-28	Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Feb. 24-28	Syracuse, N. Y., Automobile Show, State Armory, Syracuse Automobile Dealers' Assn.
Feb. 28	Santa Monica, Cal., Grand Prix Race.
Feb. 28	Columbus, O., Automobile Carnival, Columbus Auto Trades Assn.
March 2-4	Cincinnati, O., Commercial Vehicle Show, Cincinnati Automobile Dealers' Assn.
March 2-7	Sioux City, Ia., Show, New Auditorium Bldg., Sioux City Auto Club Assn.
March 2-7	Utica, N. Y., Show, Automobile Club, W. G. Comstock, Manager.
March 3-7	Fort Dodge, Ia., Show, Fort Dodge Auto Dealers' Assn.
March 3-7	Tiffin, O., Show, *Tiffin Advertiser.*
March 7-14	Hamilton, Ont., Passenger and Truck Show.
March 7-14	Boston, Mass., Automobile Show.
March 9-14	Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
March 17-21	Boston, Mass., Truck Show.
March 18-22	Sharon, Pa., Auto Show.
March 21-28	St. John, B. C., Show, Armory, New Brunswick Auto Assn.
April 9-15	Manchester, N. H., Automobile Show.
April 12-19	Prague, Austria, Eleventh Annual International Auto Exhibition, Royal Tiergarten.
May 30	Indianapolis, Ind., 500-mile Race, Indianapolis Motor Speedway.
June 24-26	Chicago, Ill., Seventh Annual Meeting of Nat. Gas Engine Assn.
July 3-4	Tacoma, Wash., Road Races, Tacoma Carnival Assn.
July 4	Sioux City, Iowa, 300-mile Race, Sioux City Auto Club and Speedway Assn.
July 4	Lyons, France, French Grand Prix.
July 13-14	Seattle, Wash., Track Races, Seattle Speedway Assn.
July 25-26	Belgium Grand Prix Road Races.
Aug. 28-29	Chicago, Ill., Elgin Road Races, Chicago Automobile Club.
Sept. 9	Corona, Cal., Road Race, Corona Auto Assn.
Oct. 1	Paris, France, Kerosene Motor Competition.
Oct. 19-26	Atlanta, Ga., American Road Congress of the American Highway Assn. and the A. A. A.
November	El Paso, Tex., Phoenix Road Race, El Paso Auto Club.

The Week in the Industry

Motor Men in New Roles

NICHOLS Now Selling Franklin—J. A. Nichols, Jr., formerly Franklin district sales manager in the Northwest territory with headquarters at Seattle, Wash., has resigned his position to take up the Franklin dealership. He is now Franklin dealer in Spokane, Wash., doing business under the name of the Franklin-Nichols Co.

Martin Joins Commerce Truck—J. J. Martin, formerly with the Commerce truck company, has recently joined the sales force of the Stewart Motor Corp., Buffalo, N. Y. He will maintain headquarters in Chicago, Ill., and have charge of the territory and Stewart sales of Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, North and South Dakota, Iowa, Nebraska, Missouri, Kansas, Oklahoma, Colorado, Texas and Kentucky.

Campbell Johns-Manville Manager—The H. W. Johns-Manville accessory will be opened in St. Louis, Mo., early in March on Locust street. R. F. Campbell will manage it.

Appointed New Departure Agent—Fred Campbell has been appointed agent in St. Louis, Mo., for the New Departure Ball Bearing Co.

Davis Jackson Manager—W. W. Davis has been selected as manager of the Poore Bros. Automobile Co., San Francisco, Cal., distributor of Jackson cars.

Bulask Cyclecar Co. Manager—H. C. Bulask has been appointed manager of the recently incorporated California Cycle Car Sales Co., San Francisco. This company will handle the Greyhound cyclecar business in Frisco and the vicinity.

Holmes Franklin Sales Manager—Arthur Holmes, vice-president of the Franklin Automobile Co., Syracuse, N. Y., has assumed charge of the Franklin sales department succeeding J. G. Barker, resigned.

Lasher In New Work—H. B. Lasher, who was a pioneer in the development of automobile advertising in newspapers, has been appointed advertising manager of the automobile department of the *Philadelphia Press*, of which he has been manager of the automobile department for the past year.

Haines Resigns from Anderson—W. P. Haines has resigned from his position as advertising manager of the Anderson Electric Car Co., Detroit, Mich.

Rumely Resigns—M. C. Rumely, who entered the service of the M. Rumely Co., Laporte, Ind., 30 years ago, and who during this time has been connected with nearly every department of the big department, has resigned. After a rest he will enter business for himself.

Dugan Promoted—J. A. Dugan has been appointed to the position of vice-president and sales manager of the Standard Auto Co., Louisville, Ky., agent for the Cole, Reo and Regal pleasure cars and the Woods electric. George Dunham has severed all connection with the concern. C. L. Anderson will continue as general manager.

Bell Detroit Remy Manager—George Bell, formerly general sales manager of the Esterline Co., has been appointed manager of the Detroit, Mich., branch of the Remy Electric Co., E. F. Willett, former manager having resigned to assume a new position.

Poole Hupp Australian Representative—C. G. Poole has been appointed permanent representative for Australasia by the Hupp M. C. Co., Detroit, Mich. He will have headquarters in Sydney, and will take over the duties performed by E. A. Eager, who first introduced the Hupmobile in Australia.

Uihlein Universal Truck Manager—George Uihlein of Milwaukee, Wis., has established headquarters at Detroit, and will personally take charge of the management of the Universal Motor Truck Co., that city. G. L. Brush, formerly assistant secretary, has resigned his position.

Garage and Dealers' Field

Takes Timken Agency—The John Immel & Sons Co., Columbus, O., has taken the exclusive agency for the Timkin roller bearings for central Ohio.

Bus Service in St. Louis—The Rapid Transit Co., St. Louis, Mo., recently placed its motor-bus into service. Five new trucks will be added in the near future.

Farr Hydraulic System Distributor—The H. L. Hadden Co., 202 Mitchell Bldg., Milwaukee, Wis., state distributor for Bethlehem spark plugs, has been appointed Wisconsin distributor for the Farr hydraulic system for storing and handling fuel and lubricant.

Montreal Wants Fire Apparatus—Tenders will be received up till March 26 for the supply and delivery of motor driven fire apparatus at Montreal, Que.

Takes Overman Tire Agency—The Comet Motor Co., Montreal, Que., has taken on the representation of the Overman tire.

Montreal's Three Big Garages—Three garages will be erected by the Autobus Co., Montreal, Que., each to be three stories high with a concrete structure to cost between $40,000 and $75,000 each.

Cars Sell for $9—The receivers for the Bradford Automobile Co., Wilmington, Del., recently auctioned off the effects of the company, which comprised new and second hand automobiles. These sold at from $9 to $620. The sale netted about $10,000.

Attractive Catalogs Issued—The H. J. Koehler S. G. Co., Newark, N. J., the Waverley Co., Indianapolis, Ind., and the Perfection Spring Co., Cleveland, O., have issued complete catalogs in attractive covers. The Perfection Spring Co.'s book cannot really be classed with a catalog but as an interesting little book titled "Your New Car." This book contains some very interesting data. The Koehler catalog is unusually complete, as it not only pictures and describes the small details, but recommendations are given the prospective users as well as the present owner of its truck. The Waverley catalog depicts in a beautifully illustrated pamphlet the different features of its products.

Buys Nine White Dump Trucks—The Brooklyn Alcatraz Asphalt Co., Brooklyn, N. Y., one of the largest street and road contracting concerns in America, has purchased from the White Co., Cleveland, O., nine 5-ton power dump trucks for hauling and dumping street paving material. Although motor trucks have been widely used in the transportation of street and road-making material, the Brooklyn concern has the distinction of owning the largest fleet of power dump trucks in this line of work.

Kline Agency for York—The York, Pa., branch of the Kline Motor Car Corp., whose factory was formerly located in that city, was closed recently and the interests of the company in that section of Pennsylvania were taken over by the York Garage and Service Co., organized for the purpose. The members of the concern are John Katz and Thomas Burneson, the latter manager for the Kline company at York since the removal of the main factory to Richmond, Va., more than a year ago. The building formerly occupied by the Southern Pennsylvania garage, on South George street, has been leased by the company and all the stock of repair parts for Kline-Kars has been moved there. Messrs. Katz and Burneson have taken the agency for the Kline-Kar in this territory.

Midgley Plant May Locate in Columbus—Steps are being taken by the Columbus Chamber of Commerce to secure the location of the plant of the recently organized Midgley Tire & Rubber Co., for Columbus, O. The concern was organized recently with a capital of $500,000 by Thomas Midgley and others under the laws of West Virginia. Mr. Midgley, the inventor of the Midgley tread tires, was formerly consulting engineer with the Hartford Rubber Co., and resigned that position to become general manager of the new company. It is planned to turn out 200 auto tires daily.

New Lee Tire Agencies—The Lee & Rubber Co., Conshohocken, Pa., recently added the following distributors: C. D. Franke & Co., Charleston, S. C.; Weis & Miller, Buffalo, N. Y.; Geo. W. Shroyer & Co., Dayton, O.; Borderland Auto Supply Co., El Paso, Texas; H. M. Freeman, Indianapolis, Ind.; Lee Tire & Rubber Sales Co., Jacksonville, Fla.; Motor & Machinists Supply Co., Kansas City, Mo., and the Powell Supply Co., Omaha, Neb.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Akron, O.	Oakland	Louis Zimarik
Alamosa, Colo.	Maxwell	Hampden Hdwe. & Fur. Co.
Albert Lea, Minn.	Maxwell	Jenson, Pederson & Hatte.
Alda, Neb.	Maxwell	W. B. Rolston
Aurora, Ill.	Maxwell	A. H. Annis
Austin, Minn.	Maxwell	C. J. Cristie
Bangor, Pa.	Hupmobile	Bray's Garage
Bardstown, Ky.	Hupmobile	Hardstown Garage
Berwick, Pa.	Hupmobile	R. E. Paden
Birmingham, Ala.	Maxwell	Alabama Motor Co.
Blue Earth, Minn.	Maxwell	Quiggle Bros.
Bridgeport, Ill.	Hupmobile	Illinois Motor Co.
Brookings, S. D.	Maxwell	P. N. Pederson
Brooksville, Ky.	Hupmobile	Dr. W. E. Corliss
Buffalo, N. Y.	Briscoe	Monroe Motor Car Co.
Byron, Neb.	Maxwell	H. C. Reinke
Cambridge, O.	Maxwell	Arnold & Urban
Camden, O.	Maxwell	Crauder & Pugh
Carruthersville, Mo.	Hupmobile	C. D. Robinson
Cedar Rapids, Nebr.	Maxwell	Mensborn Bros.
Central City, Ky.	Buick	Barnes Auto Co.
Centralia, Ill.	Reo	Roamer Motor Car Co.
Chicago, Ill.	Briscoe	Tennant Motor Co., Ltd.
Chicago Heights, Ill.	Maxwell	Conklin & Spindler
Collins, Ga.	Maxwell	A. C. Ellenwood
Columbia, Mo.	Reo	West & Venatta
Conger, Minn.	Maxwell	Conger Auto Co.
Cornish, Okla.	Maxwell	R. O. Dulaney
Danville, Ill.	Maxwell	E. B. Collins Motor Co.
Dawson Springs, Ky.	Buick	R. S. Hunter
De Mossville, Ky.	Maxwell	Hopkins & Hopkins
Fort Scott, Kas.	Maxwell	W. F. Pritchard
Frankfort, Kas.	Oakland	Fundis & Fundis
Frederic, Wis.	Maxwell	Cyril C. Sandberg
Goldendale, Wash.	Maxwell	Goldendale Machine Shop & Auto Garage Co.
Greenville, Ky.	Hupmobile	J. P. Morgan
Harrisonville, Mo.	Chalmers	Scruggs & Van Riper
Harrodsburg, Ky.	Hupmobile	Walter Martin
Henderson, Ky.	Hupmobile	W. H. Fitzhugh
Horse Cave, Ky.	Hupmobile	Horse Cave Garage
Humboldt, Ia.	Maxwell	Jackson Motor Car Co.
Hutchinson, Kas.	Oakland	Painter & Oliephant Motor Co.
Independence, Mo.	Pathfinder	C. W. Latimmer
Jeromeville, O.	Oakland	J. C. Clippinger & Co.
Joplin, Mo.	White	Davis Auto Co.
Kankakee, Ill.	Maxwell	Wm. H. Ohde
Kenosha, Wis.	Maxwell	Geo. R. Pirsch
Kimmswick, Mo.	Paige	O. G. Ohelm
La Crosse, Wis.	Oakland	Bergh Piano Co.
La Moure, N. D.	Maxwell	John Young
Lancaster, Ky.	Hupmobile	J. C. Storms & Sons
Lancaster, O.	Cadillac	Leroy Huddle
Lawrence, Kas.	Oakland	Howard Henry
Lawrence, Mass.	Chalmers	C. E. Benoist
Lexington, Ky.	Hupmobile	Kentucky Motor Sales Co.
Lincoln, Kas.	Oakland	Brill, Wisdom & Co.
Louisville, Ky.	Empire	Hiter Motor Car Co.
Louisville, Ky.	Metz	Motor Sales Co.
Louisville, Ky.	National	Hiter Motor Car Co.
Louisville, Ky.	Paige	Motor Sales Co.
Louisville, Ky.	Reo	Standard Auto Co.
Manhattan, Kas.	Empire	J. L. McCray
Manhattan, Kas.	Pathfinder	J. L. McCray
Manhattan, Kas.	White	S. W. Forrester
Mantua, O.	Maxwell	Crafts Garage
Marshall, Ill.	Maxwell	Chas. Brandenstein
Meridian, Tex.	Maxwell	Odle & Adams
Metropolis, Ill.	Paige	I. N. Greene
Middlesboro, Ky.	Buick	Brashear & Brummett
Milwaukee, Wis.	Briscoe	I. W. Menhall Auto Co.
Minneapolis, Minn.	Briscoe	E. B. Stimson
Minonk, Ill.	Maxwell	Minonk Garage Co.
Moberly, Mo.	Paige	F. J. Williams
Moline, Ill.	Reo	I. Brandes, Jr.
Monroe City, Mo.	Reo	Woodson & Graham
Montgomery, Ala.	Maxwell	Cole Motor Co.
Mt. Carroll, Ill.	Hupmobile	W. A. Spencer
Mt. Sterling, Ky.	Buick	Stone & Flora
Murray, Ky.	Buick	E. D. Miller
Muskogee, Okla.	Oakland	Oakland Sales Co.
Neligh, Nebr.	Maxwell	Winn & Wilson
Newark, N. J.	Briscoe	I. W. Mason
New Haven, Conn.	Oakland	The Burns-Thomas Co.
New York City	Briscoe	Partridge, Clark & Kerrigan
New York City	Herreshoff	Shipman, Ltd.
Olathe, Kas.	Oakland	Olathe Auto Co.
Omaha, Neb.	Briscoe	C. W. McDonald
Owenboro, Ky.	Hupmobile	Harry Bortorf
Paris, Mo.	Reo	C. F. Pelsue
Pawhuska, Okla.	Oakland	Easterbrook & Stevens
Pelva, Mo.	Chevrolet	Xander & Kimbley
Pendleton, Ore.	Maxwell	Rose & Brown
Pennsboro, W. Va.	Maxwell	Cunningham & Wilson
Pensacola, Fla.	Maxwell	J. D. Anderson
Philadelphia, Pa.	Briscoe	M. J. La Roche
Pittsburgh, Pa.	Briscoe	Hiland Motor Co.
Plate Center, Ill.	Maxwell	Jas. Muirhead & Son
Pleasant Hill, Mo.	Oakland	Oakland Sales Co.
Porter, Minn.	Maxwell	Miller & Berg
Preston, Md.	Maxwell	J. L. Covey
Princeton, Ill.	Maxwell	Evans-Coppins & Starks Co.
Riley, Kas.	Oakland	H. H. Gravenstein
Rochelle, Ga.	Maxwell	Valentine & Son
Rolia, Mo.	Reo	Buchannan & Gooch
Sacramento, Cal.	Maxwell	W. J. Mannix
Salina, Kas.	Empire	Burke & Schindler
Salina, Kas.	Pathfinder	Burke & Schindler
Scranton, Kas.	Empire	Sappensield & Co.
Scranton, Pa.	Herreshoff	B. E. Woodcock
Scranton, Kas.	Pathfinder	Sappensield & Co.
Seattle, Wash.	Case	E. J. Jaeger & Sons
Seattle, Wash.	Haynes	N. J. Morehouse
Seattle, Wash.	McIntyre	McIntyre Motor Sales Co.
Shelbyville, Ky.	Buick	William Burnett
Shelbyville, Ky.	Hupmobile	Guy S. Wells & Son
Sherburn, Minn.	Maxwell	A. D. Packard & Son
Smithville, Mo.	Empire	Burke Edwards
Smithville, Mo.	Pathfinder	Burke Edwards
South Shore, S. D.	Maxwell	Klix & Stomacher.
Spokane, Wash.	Chevrolet	R. S. Young
Spokane, Wash.	Maxwell	C. H. Hornberg Auto Co.
Springfield, Mo.	Chandler	I. E. Atkinson
Stafford, Kas.	Oakland	R. J. Fuller Garage Co.
Stanberry, Mo.	Oakland	Tennant Bros.
Stanford, Ky.	Hupmobile	W. E. Glover
St. Louis, Mo.	Briscoe	Weber Implement & Auto Co.
St. Louis, Mo.	Pathfinder	Pathfinder Auto Co.
Strawn, Ill.	Maxwell	Hanlan & Myers
Sycamore, Ill.	Maxwell	Loptien Bros.
Sylacauga, Ala.	Maxwell	Hagen Bros.
Tamorad, Ill.	Chevrolet	H. E. Doolittle
Tilden, Neb.	Maxwell	Fred Ritter
Upper Sandusky, O.	Oakland	Longabaugh Bros.
Urbana, O.	Mitchell	The Only Garage
Washington, D. C.	Detroiter	W. L. Smith Co.
Washington, D. C.	Ohio	Potomac Motor Car Co.
Washington, D. C.	Regal	Motor Sales & Service Co.
Watervliet, N. Y.	Herreshoff	E. F. Wilcox
Waynesboro, Miss.	Maxwell	R. W. Fagen & Co.
Waxahachie, Tex.	Maxwell	T. C. Grimland
Webster, Minn.	Maxwell	Arneson Bros.
West Salem, O.	Oakland	Leroy-Smalley Auto Co.
Wichita, Kas.	Oakland	Oakland Auto Co.
West Frankfort, Ill.	Reo	Pharis & Son
Wellington, Kas.	Oakland	Ash Implement Co.
West Salem, O.	Maxwell	Rumbaugh & Read
Westside, Ia.	Maxwell	Patterson & Campbell
Wilburton, La.	Hupmobile	Putman Bros.
Wilkes-Barre, Pa.	Hupmobile	John Zorzi
Williamstown, Ky.	Buick	Williamstown Motor Car Co.
Winchester, Ky.	Buick	Winchester Garage
Winchester, Mass.	Oakland	Mystic Valley Garage

COMMERCIAL VEHICLES

Place	Car	Agent
Atlanta, Ga.	Horner	D. J. Lignon
Chicago, Ill.	Horner	Feldt Motor Co.
Kansas City, Mo.	Knox Tractor	C. F. Rouze Motor Co.
St. Louis, Mo.	Atterbury	Southern Auto Co.
St. Louis, Mo.	Hewitt	Brinkman Motor Car Co.
St. Louis, Mo.	Mack	Brinkman Motor Car Co.
St. Louis, Mo.	Saurer	Brinkman Motor Car Co.

CYCLECARS

Place	Car	Agent
Kansas City, Mo.	La Vigne	Roy Kendall
London, Eng.	Imp	H. G. Sharp
Los Angeles, Cal.	Imp	Western Cyclecar Co.
Munich, Germany	Imp	W. W. Pike
Seattle, Wash.	Imp	McIntyre Motor Sales Co.
St. Louis, Mo.	Comet	Columbia Motor Co.
St. Petersburg, Russia	Imp	T. D. Pluyn & Ochs
Trinidad Islands, P. A.	Imp	Carl A. Boos
Wheeling, W. Va.	Imp	A. C. Hervey

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BROCKTON, MASS.—Sterling Motor Co.; capital, $50,000. Incorporators: William R. March, Guy M. Green, Rena M. Mackin.

BROOKLYN, N. Y.—Globe Motor Car Co.; capital, $5,000. Incorporators: Franklin G. Dunham, Henry W. Allers.

CAMDEN, N. J.—Brown & Robb Co.; capital, $100,000; to manufacture automobiles. Incorporators: E. L. Brown, T. H. Robb and Herman Johnson.

CHICAGO, ILL.—A. C. Coey Motor Co.; capital, $50,000; to manufacture automobiles and accessories. Incorporators: A. C. Coey, H. L. Wells, H. H. Morgan.

CHICAGO, ILL.—Standard Motor Car Co.; capital, $10,000. Incorporators: Eric Kullberger, David Gordon, B. Christiansen.

CINCINNATI, O.—Remelin Company of Cincinnati; capital, $40,000; to deal in automobiles and supplies.

COLLINGWOOD, O.—The Collingwood Garage Co.; capital, $10,000; to do a general automobile and taxicab business. Incorporators: Carl Lemster, Otto Hankinson, Karl S. Lemster, Bert Decker, Clyde L. Deeds.

EL PASO, TEX.—International Auto Co.; capital, $30,000. Incorporators: J. W. Stockard, R. W. Newton, J. F. Primm.

FT. WAYNE, IND.—Randall Auto Sales Corp.; capital, $20,000; to deal in automobiles. Incorporators: A. L. Randall, G. E. Randall and M. A. Randall.

INDIANAPOLIS, IND.—Interstate Automobile Company of Muncie; capital, $300,000. Incorporators: B. W. Twyman, F. C. Ball, E. R. Ball, G. A. Ball, J. M. Maring, T. F. Rose and F. D. Rose.

INDIANAPOLIS, IND.—Automatic Gas Motor Co.; capital, $200,000; to manufacture a gas motor for motor cars, motor boats and cyclecars Incorporators: E. E. Stafford, C. W. Hackleman, Henry F. Campbell, Hervey Bates and Fred B. Whitlock.

LA PORTE, IND.—Indiana Auto Supply Co.; capital, $10,000; to do a general auto and repair business. Incorporators: Arthur Gaul, William Pelz.

Accessories for the Automobilist

PRESTO RIM—The most recent development in the rim field is the Presto made by the Presto Inter-Rim Co., Boston, Mass. The feature of this new device, Figs. 1, 2 and 3, is the method of removing the rim, this being accomplished by expanding the locking ring that holds the rim in place. It will be noted that the rim is expanded by a lever that snaps back against the felloe of the wheel when not in use. When the tire is replaced the locking ring is contracted, and thus the rim is securely fastened in place. No bolts, nuts or tools of any kind are required to change a tire when these rims are used. The locking ring is so designed that it comes off easily and will not stick. When in place it has a continuous bearing between the felloe band and the top rim thus preventing rusting and squeaking. The Presto rim can be changed in 30 seconds, it is claimed, and is made in all standard sizes to fit straight side, clincher or solid tires. A set of five rims costs from $40 to $75 depending on the size, rims under 36 by 3½ being sold at the former figure and rims over 36 by 5½ inches at the latter price.

Tri-Phoon Pumps—The Green & Swett Co., Boston, Mass., has recently joined the ranks of the power tire pump makers by bringing out a three-cylinder pump that is designed to be driven by the engine, Fig. 4, and three and six-cylinder pumps for garage use, Fig. 5. The pump that is made for installation under the hood is very compact, being 4 inches wide, 4 inches high and 6 inches long. This pump contains three reciprocating pistons driven by a large rotating cam, the pistons being controlled on the cam surface by means of roller bearings. The cam and the roller bearings are made from high-grade steel and are hardened and ground. In place of the old style leather cup washers specially constructed metal piston rings are used. By the use of the cam construction the crankshaft, connecting rods, eccentrics and gears are eliminated and for this reason it is claimed that the pump will last indefinitely. The pump is installed on the engine by means of a bracket and is driven from the crank, magneto, pump or camshaft by gears or a silent chain, as desired. The pump is thrown into action by means of a suitable clutch. This pump can be run as high as 1,500 revolutions per minute although a speed of 800 is advised on the average. It delivers air at 115 pounds per square inch. The manufacturers are prepared to furnish brackets and fittings which will make the installation of this pump a very simple matter. The price with pump hose and gauge is $20, while with gears and fittings for attaching the price is $25.

Fig. 4—Tri-Phoon engine driven tire pump. This pump has three cylinders, the pistons in which are actuated by a cam. It delivers air at 115 pounds per square inch

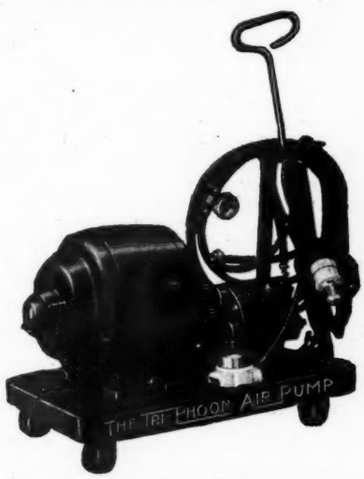
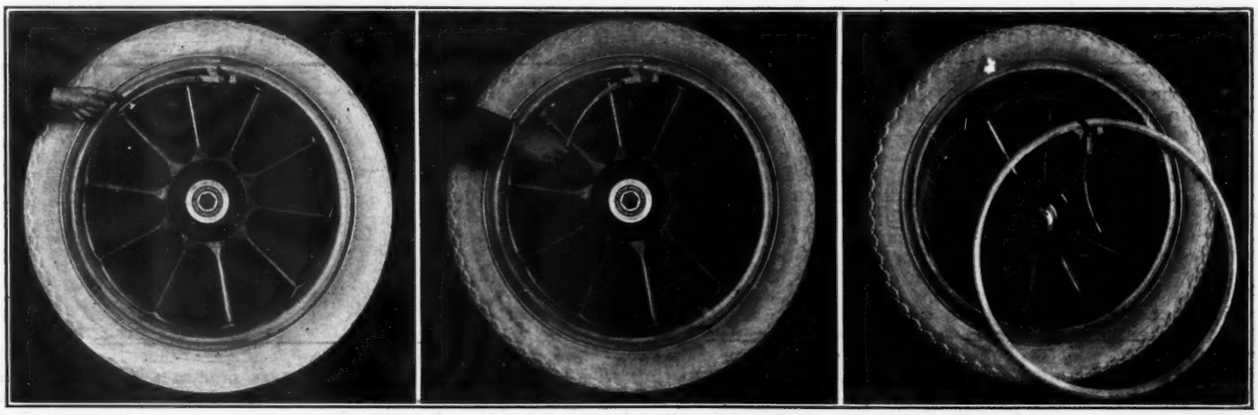


Fig. 5—Tri-Phoon garage pump. This pump is made in three and six-cylinder models and is driven by a small electric motor. The whole is mounted on a truck for facilitating transportation around the garage

Tri-Phoon garage pumps are made in both three and six-cylinder styles and are designed to be electrically driven, through spur gearing, by a small motor. The whole outfit is mounted on a truck fitted with casters so that it can be readily transported about the garage. The equipment includes an electric light cord with plug, and a hose and pressure gauge. The manufacturer gives a liberal guarantee with all pumps, replacing free of charge any pumps found to be defective or faulty in construction, within one year.

Wasson Piston Ring—A piston ring that is radical in its construction yet presents many commendable features is made by the Wasson Piston Ring Co., Hoboken, N. J. It varies from the usual type in that it is concentric, or in other words its cross-section is uniform. The special advantage claimed for the Wasson ring is that it exerts an even pressure at all points in the cylinder, and that because it is concentric it fits the cylinder bore better than the eccentric style. Equal radial pressure at all points is obtained by expanding the metal on the inner surface of the ring in a special machine. The Wasson ring has been adopted by many of the foremost manufacturers.

Rad-Fix for Leaky Radiators—A compound has recently been put on the market by the Radiator Fix Co., Boston, Mass., for fixing leaky radiators without soldering or removing them from the car. It is applied by pouring into the radiator and closes up the cracks by crystallizing when exposed to the air, in other words, when this solution oozes



Presto demountable rim: Fig. 1—Rim in place. Fig. 2—Demounting rim by expanding locking ring. Fig. 3—Rim dismounted

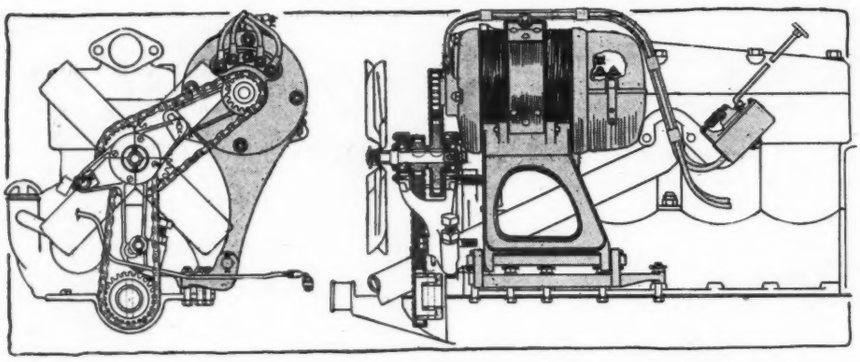


Fig. 6—North East Ford starter: Left—Front elevation. Right—Side view

from a crack the air evaporates some of the liquid, which causes the rest to crystallize. Thus in principle it is like the stoppage of blood flow from a cut by the formation of a clot which later dries into a scab. It has no harmful action on the metal parts and does not interfere with anti-freezing solutions. It boils at 260 degrees Fahrenheit or 48 above water and freezes at 6 degrees below the freezing point of water. Therefore, with its use, there is less danger of the cooling water boiling away in hot weather and less danger from freezing in cold. Rad-Fix is sold in gallon cans and is backed by an unusually strong guarantee. The price is $2 per gallon.

North East Ford Starter—One of the most important Ford accessories put on the market recently is a starting and lighting system made by the North East Electric Co., Rochester, N. Y. Motor and generator are combined into one unit, the same armature winding, commutator and brushes being used when the unit is being operated as a motor and when it is running as a generator. The unit, Fig. 6, is mounted on a bracket at the left of the motor and is driven from the front of the crankshaft by silent chains. A double reduction between engine and generator is provided, the chain from the crankshaft driving an intermediate sprocket, from whence the drive to the generator is taken by a larger sprocket. The frame supporting the generator also affords the support for the intermediate sprocket and chain adjustment is accomplished by moving this sprocket outward. The attachment of the North East system is simple, the base of the generator bracket bolting to the top of the crankcase, the bolts replacing those that hold the halves of the crankcase together so that no drilling or fitting is required. The starting switch is operated by a pedal and is so designed that by clamping the switch bracket to the outlet flange of the water manifold the switch pedal will extend through the floor board. Thus in fitting this member it is only necessary to drill a hole through the floor boards of the car.

The motor-generator is designed to operate on 24 volts but the lamps are connected in parallel so that they only require half this voltage. The wiring is simplicity itself. Two leads run directly from the storage battery to the motor-generator. These supply current for starting, but for lighting a third wire is added, this wire running from an intermediate binding post on the battery to the dash switch. The lamps on one side of the car are connected between the switch and one of the leads to the motor-generator and the lamps on the other side between the switch and the other one.

Gilbert Wire Wheel Covers—The increasing use of wire wheels has led the Gilbert Mfg. Co., New Haven, Conn., to add two designs to its well-known line of tire covers. One is an open style which covers the tire and rim only while the other incloses the whole wheel. In the former, Fig. 7, the opposite edges of the cover are held in place by straps that pass across the inner edge of the rim. This style is recommended where the tire is to be carried on the side of the car. The inclosed type of cover protects the entire wheel and tire, and is designed especially for wheels that are carried at the rear. It has a leather reinforcement washer at the hub and is fitted with special openings for the tire holder straps to pass through. Both covers are offered in either black enamelled duck or artificial leather. The open cover sells for $3 when made of the former material and $3.50 of the latter, while the inclosed cover retails at prices ranging from $5 for the 36-inch black enamelled duck style to $8 for the 37-inch and over sizes in artificial leather. The imitation leather covers can be had in any color, while the duck covers are ordinarily finished in black, although other colors are obtainable at a slight extra charge.

Dover Offset Funnel—Four new accessories, Fig. 8, have been brought out this year by the Dover Stamping & Mfg. Co., Cambridge, Mass.: An offset funnel; a large garage funnel; a soap economizer, and an electric bulb case.

The offset funnel is to facilitate the filling of gasoline tanks that are inaccessible with the ordinary type and its development is due to the increasing practice of mounting the tank at the rear. The spout is offset 10 inches and is rigidly held to the mouth of the funnel by a brace that extends from the end of the offset. The offset is detachable so that when not needed it can be taken off. The funnel is equipped with a fine brass strainer and the chamois is held in place by a hoop that slips over the funnel top. The funnel is heavily copper plated and comes in two sizes, the 4-quart selling for $2.00 and the 8-quart for $2.25.

The soap economizer consists of a perforated pail that is filled with four to six pounds of soap and then suspended in the water washing tank, or barrel. This arrangement supplies plenty of soapy water, yet no soap is wasted. If desired, the pail can be locked to prevent the workmen tampering with it. The price of the 6½-pound size is $2.50.

The garage funnel is featured by its large capacity, it holding 10 quarts. It is made of galvanized iron and is fitted with a 100-mesh strainer which is removable. The strainer is conical in order to give increased strength and provide greater surface. The price of the funnel is $1.75.

The electric bulb case is designed to meet the needs of the motorist who carries an extra set of bulbs. It furnishes a secure method of transportation and eliminates the possibility of breakage that is present when the bulbs are stored in a paste board box or some other makeshift container.

The case has space for two head and sidelights, and tail and speedometer lights. The lamps are securely held in place by a spring locking device. The box is made of heavy seamless sheet steel, enameled black, and is provided with an automatic spring catch cover. It measures 5⅜ by 3¾ by 3⅜ inches and sells for $.75.

Fuller Cyclecar Transmission—Fuller & Sons Mfg. Co., Kalamazoo, Mich., announces the completion of a small two-speed planetary transmission, suitable for cyclecars or similar small cars. Light weight with maximum strength are attained in this design by using high grade materials throughout. This transmission will handle small 4-cylinder motors of 2¾-in. bore x 4-in stroke, on cars weighing up to 1,000 lbs. A multiple disk clutch is used, giving very easy engagement. All the gears are hardened and many of the parts are drop forgings. Bands are also supplied for either chain or shaft drive and are equipped with levers for contracting them onto the transmission drums. The low and reverse bands may be operated by pedals.

Fig. 7—Gilbert wire wheel case

Fig. 8—Dover products: Top, left—Offset funnel. Top, right—Garage funnel. Bottom, left—Soap economizer. Bottom, right—Electric bulb case